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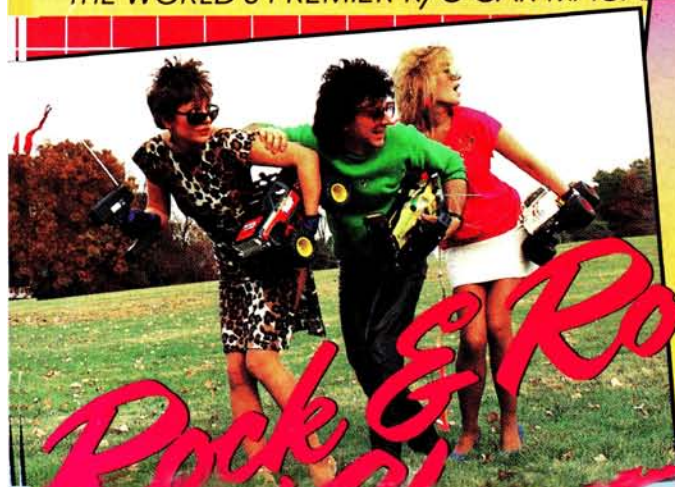
February 1987

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Radio Control **CAR ACTION**

THE WORLD'S PREMIER R/C CAR MAGAZINE



*Rock & Roll
R/C!*



**Killer
KO Radio**

**MONSTER
BLACKFOOT**



**Custom-
Airbrushing Tips**

Lethal Grasshopper



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Volume 2, Number 1
February 1987

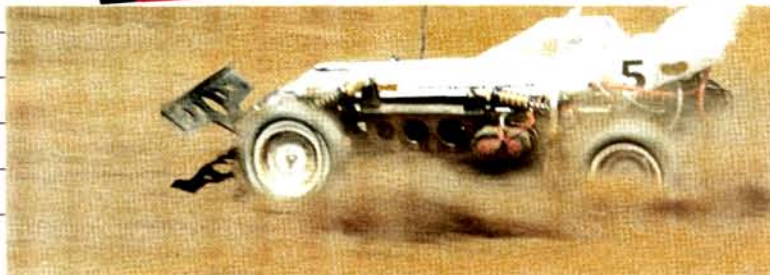
On the Cover: Nothing but R/C wildness for you in this issue as evidenced by these photos! It's Rock & Roll R/C all the way with these zany modelers, but the real rocker is the awesome new Blackfoot from the wizards at MRC and the article starts on page 58. The new KO Radio from Hobby Shack also deserves top billing and see Commander Charlie's review on page 18. Rock and Roll and Blackfoot photos by Louis DeFrancesco. The fabulous Arce Studios gets credit for the KO radio shot.

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EDITORIAL

by LOUIS V. DeFRANCESCO JR.

BY THE TIME you read this editorial, Christmas shopping will be in full swing and, according to an article in *Fortune* magazine, radio-control cars have charged into the limelight, and will be a very desirable item under the Christmas tree. I've seen R/C cars advertised everywhere from TV to major chain store catalogs. It's R/C mania and we're all the benefactors!

Once in a while we receive a letter of complaint about a car that a concerned modeler has purchased. Usually the modeler is upset about the car's performance or a weak area in the drive train or suspension. It is very difficult to ascertain whether the product actually is inferior or the car was built incorrectly, or even was subjected to tremendous abuse. Any product—R/C car, BMX bicycle or toaster oven—will eventually wear and be in need of repair. If we receive enough letters about a car with a recurring problem, we can then surmise that the car legitimately does have a weak link, in which case we will contact the manufacturer and then inform you, the modeling consumer.

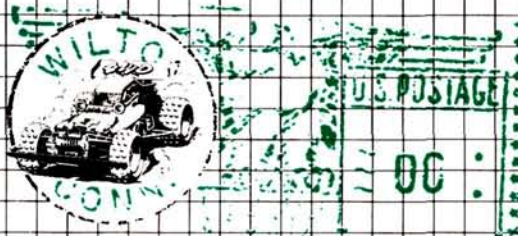
Because of the tremendous time constraints we work within, we cannot test cars over an extended period of time and therefore it is difficult to see what parts are more susceptible to wear. Generally speaking, the radio-control cars available today are of good quality and we have yet to come across a real "lemon."

THIS MONTH. We have another fantastic issue planned for you, including a custom-airbrushing article, hot R/C stock cars, the new monster Blackfoot truck from MRC—unquestionably the hottest item since the invention of the R/C truck from MRC—plus a slew of great modeling tips and hot track reports on the latest R/C road warriors! Enjoy!

Great news! As of this issue, we'll be publishing *Radio Control Car Action* on a bimonthly basis. Due to increasing demand, we'll now be bringing you six great issues a year. Thanks for your support! ■



Letters



Accolades!

After the third issue of *Radio Control Car Action*, I just can't wait for the next to reach the stand. The slogan for the mag certainly is borne out by its contents. Cheers!

C.P. TAY
Kuala Lumpur, Malaysia

Problem Cars

My first car was the Marui Galaxy RS. I'd like to see a review of the car, and would like to know why the idler gear keeps stripping and the car handles like a cow on ice. Every hobby shop stocks this gear and the lifespan of a new one is just as short as the one it replaces—and I'm told there's not much I can do about this.

RICHARD BOURDON
Quebec, Canada

Richard, we haven't reviewed the Galaxy but we've heard other complaints about it. Sorry that we can't recommend a stronger aftermarket gear. You might have luck in contacting the importer. We'll be covering "problem cars" in upcoming issues as requests come in.

LVD

R/C Motorcycle

I like your excellent magazine. I've seen some races of funny R/C motorcycles and I'd like to buy one here. Can you help me find it? And also, why are no other magazines including this fantastic new hobby, so pervasive in Europe, to appease the mounting R/C enthusiasm? Thank you.

JOHN MANARA
Los Angeles, CA

John, you saw it here first! In the "What's New" section of this issue you'll find the finely engineered Commando, manufactured by DWA and distributed by RPS Dist., 1655 East Mission Blvd., Pomona, CA 91766. And a track report by Steve Pond is on the way.

LVD

FCC Law

After reading the Summer '86 issue of your magazine, I decided to get a MRC/Tamiya Hornet. I'm wondering if a Challenger 2000 radio is good for it.

CHARLES PLAYER
Charleston, SC

Yes, but be sure it's on a surface-only frequency—if not, you'll be in violation of FCC law, which forbids running your car on an airplane frequency. And if you get caught by a monitor, it's trouble.

LVD

In your Summer '86 issue you said that there would be a "full-blown review" of the Hobby Shack Big Grissly. So, I picked up the next issue and there was no review. I hope you'll put it in your next issue.

MORLEY OUDERKIRK
Nepean, Ontario K2E 7A9

Sorry for the delay, Morley, but the "full-blown review" is on the way. There's been a lot of R&D by the manufacturer and we'll feature their final product very soon.

LVD

I enjoy your magazine like no other. You guys write excellent track reports—can you do one on the AYK Bobcat and Buffalo?

MARK REID
Albuquerque, NM

In this issue we have two AYK cars and we'll be featuring more in the future.

LVD

6 to 1: Half Dozen to The Other?

What a super-great magazine—outstanding articles and pictures. The technical articles are excellent; they leave no leaf unturned; very clear and informative.

It's confusing to understand gear ratios! how about an article on gears and how to figure ratios?

MICHAEL P. CORCORAN SR.
Mount Clemens, MI

It's already in the works, and thanks for the kind words.

LVD

I've decided to change from an electric-powered car to a gas-powered car. I've already chosen the Assault. Can you tell me whether this is a good gas car?

CHRIS YATES
Edmond, OK

Decide for yourself, Chris: see the Summer '86 issue for the track report.

LVD

I was wondering if you would do an article on cars that kids can afford; for example, the Tyco Turbo Hopper.

REAGAN WILES
King, NC

Coming up next month!

LVD

More Questions (and Answers!)

Recently I purchased a copy of your magazine. I'm a 12-year-old R/C enthusiast living in Australia and haven't seen any other magazines of this caliber. The technical information and photography are really fantastic! Your super article on the Icarus interested me greatly. I have a question about the 360ST motor in the Icarus. Is the 360ST a faster motor than the 540 standard?

DAVID KRAUS
Sydney, Australia

The LeMans 360ST that comes as standard with the kit is definitely hotter than a stock Mabuchi 540.

LVD

Die besten grüsse aus Deutschland! (Best Greetings from Germany!)

I'm an RC-10 owner, and the article you had on the modifications to the RC-10 was worth its weight in gold. I have since given the magazine to a Frog owner—and have yet to get it back! This able to get here in Germany.

I'm also working on forming a club for service members who are into this hobby and if it catches on I'd like to build a track. Are there any rules or specifications regarding the design and building of one? Can you help us out?

ANDREW D. WHITE, SSgt, USAF
USAF Regional Medical Center, Wiesbaden,
West Germany

Check out Mike Lee's "Track Design" in our Winter '86 issue. LVD

I really like your magazine. I like the new MRC/Tamiya Blackfoot. Do you think this is a good truck?

RICHIE OLSON
Virginia Beach, VA

Chris Chianelli thinks so—turn the pages! LVD

My son and I have become interested in joining the ranks of R/C car builders and racers. During the summer, we purchased a copy of your magazine—now we've got the Fall issue too—and it really fueled our interest.

You're producing a very fine publication—excellent photos, great layout/design, interesting and easy-to-read articles. I've seen a few of the other R/C publications, and there really is no comparison. Keep up the good work!

I've always been interested in sprint cars and racing, and I think I'd like to build a 1/10- or 1/12-scale sprinter for racing. Are you planning a future article on sprinters?

RICK KOCKS
Worthington, OH

Rick, we sure will have sprint cars—in all scales—as a permanent part of our menu. Also, check the Winter issue for 1/4-scale sprints. LVD

Anybody Out There?

Are there any R/C clubs in Illinois? I'm a great fan of your magazine, which I usually purchase from Walden Books.

IMRAN AHMAD
Bolingbrook, IL

See our "Race Track Directory," formerly "Coming Events," for information on tracks in your vicinity. If that doesn't do it, write ROAR, P.O. Box 1536, Lawrenceville, GA 30426-1536 LVD

You've done a great job of putting this magazine together! I'd like an article on the four-wheel-drive Hot Shot. You've been a great help to me.

ROBERT MAHAN
Samner, TX

Robert, see the Winter '86 issue for a full track report by Rich Uravich. LVD

Motor Monitoring

MAN what a mag you've got here. Just got my hands on the Fall issue—and WOW! I've read every one cover to cover twice. How about doing an article on how to test motors with the motor testers that are on the market?

Jay "Too Fast" Peters
So. Holland, IL

Not so fast, "Too Fast," we already have that one on the drawing board for a future issue. Testing is very important, and any serious racer should always monitor the condition of his motor. LVD

We welcome your comments, and suggestions. Letters should be addressed to "Letters," Radio Control Car Action, 632 Danbury Rd., Wilton, CT 06897. Letters may be edited for clarity and length. We regret that due to the tremendous amount of letters we receive we cannot respond to every one.



THE BODY BUILDERS
A complete line of 1/10 & 1/12 scale RC Race Car Bodies and accessories at hobby shops now.

McAllister
M
Racing

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SIMI VALLEY, CA 93063



HAVE SNOW CAN GO



It's finally here!

A Winter Conversion Kit designed for 1/10-scale two-wheel-drive off-road buggies. Tested and proven. For further product information and price send \$2.00 to:

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SNOWTIME ACCESSORIES LTD.
#28-24 Central Place
Saskatoon, Saskatchewan
Canada S7N 2S2

Engine Review

by PETER CHINN

SPECIFICATIONS

Type: Air-cooled, single-cylinder side-exhaust two-stroke-cycle with crankshaft rotary-valve and Schnuerle scavenging.

Bore: 14.0 mm (0.5512 in.)

Stroke: 13.7 mm (0.5394 in.)

Displacement: 2.109cc (0.1287 cu in.)

Nominal Compression Ratio (full stroke): 9.5:1

Speed Control: Special O.S. barrel-throttle carburetor.

Checked Weight: 203 grams (7.2 oz)

Mounting Dimensions:

Crankcase width: 24 mm

Length from driver face: 80 mm

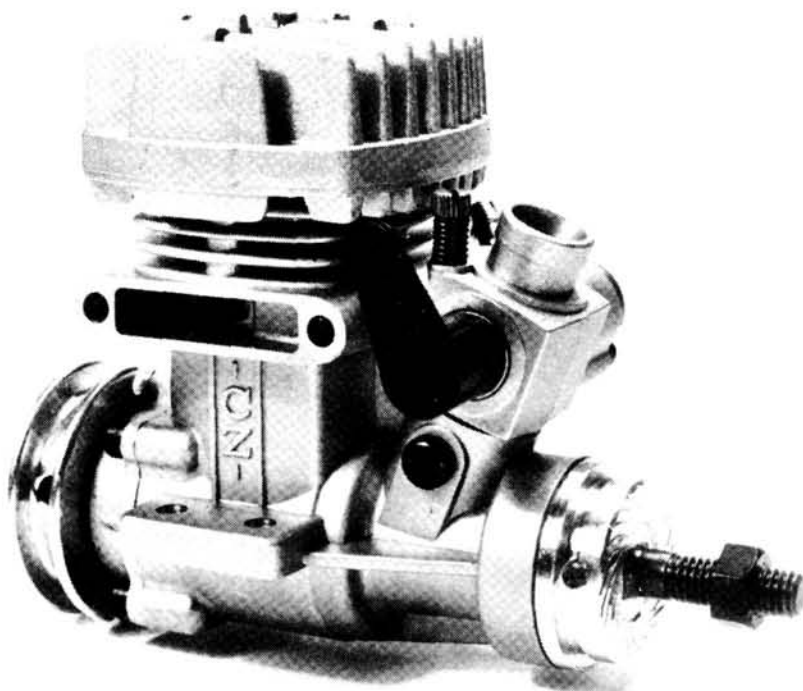
Height above CL: 54 mm

Bolt-hole spacing: 31.5x11 mm

Manufacturer's Claimed Power Output: Not stated

Manufacturer: O.S. Engines Mfg. Co., Ltd., Higashisumiyoshi-ku, Osaka 546, Japan.

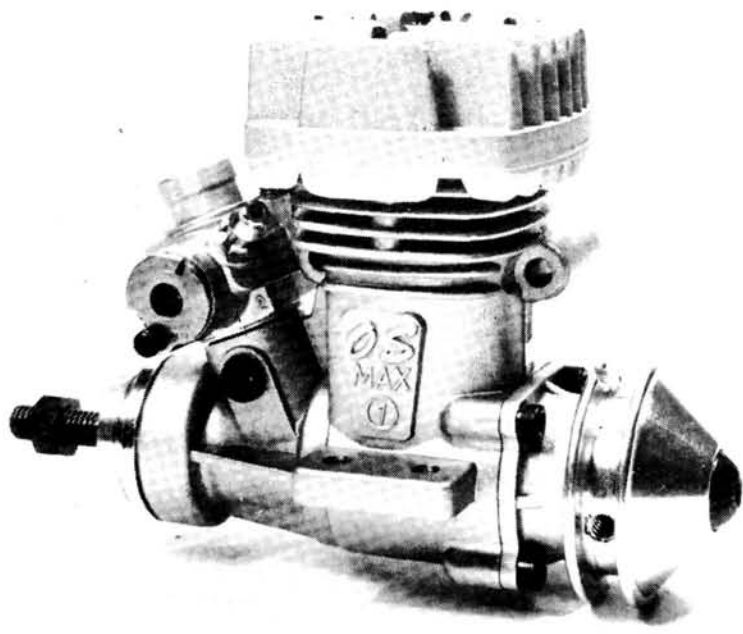
U.S. Distributor: Great Planes Model Distributors Company, P.O. Box 4021, Champaign, IL 61820.



O.S. Max CZ-1

MODEL car engines of smaller displacement than the internationally recognized 3.5cc (0.21 cu in.) competition class are not new. One-twelfth scale radio-controlled cars fitted with internal-combustion engines, in place of electric motors, were running in Japan back in 1977. In 1979 the Japanese established a class for these cars, limiting displacement to 1.8cc. This embraced engines such as the 1.75cc O.S. Max-10FSR (for which the factory then provided a heat-sink head) and resulted in the Enya company introducing a new model, the Enya 11CX, having a displacement of 1.79cc.

More recently, the great popularity of mass-produced off-road and buggy type vehicles has led to the commissioning, by the manufacturers, of special engines for these vehicles. It was for one of the latest of these, Kyosho's Assault buggy, that the O.S. company developed the new Max CZ-1 engine described here.



New small-sized O.S. car engine is standard equipment with Kyosho's Assault buggy. It was specially designed for newcomers to model cars.

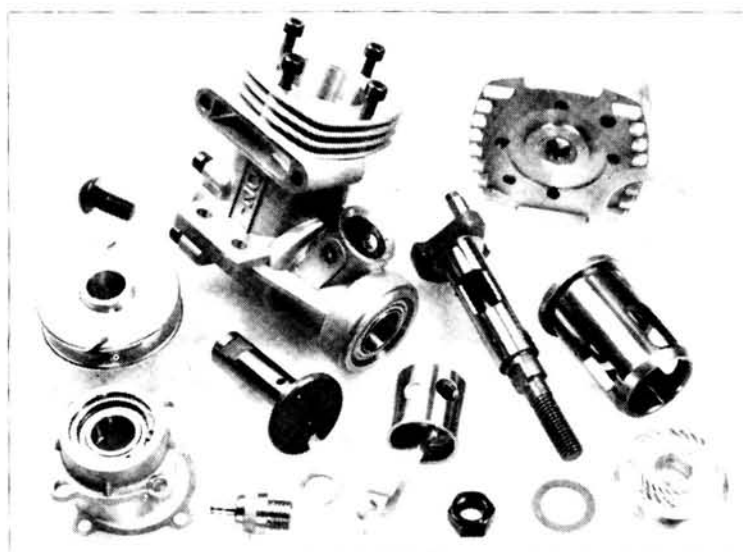
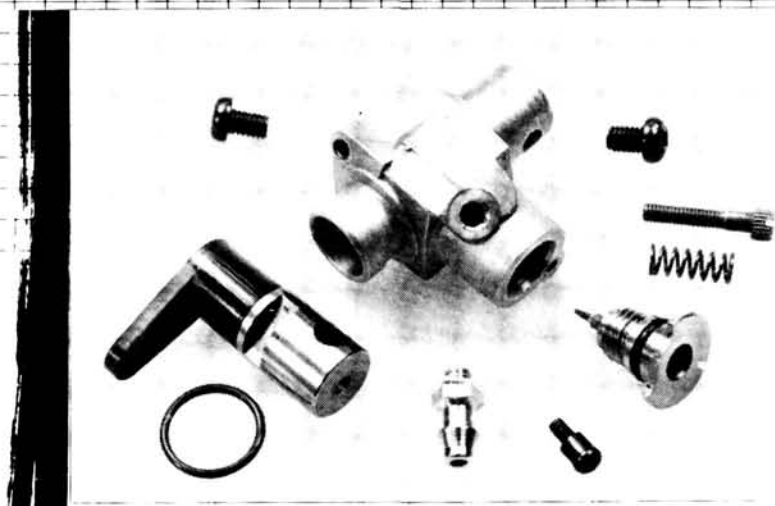
CZ-1's carburetor, developed specifically for beginners, eliminates needle-tweddling that so often confuses newcomers to the hobby.

Of major concern was to provide the purchaser with an easy handling power-plant. This is most important for those who have had no previous experience of engine-driven models. Beginners' engines are usually of simple design, sometimes bordering on the crude. No such criticism can be levelled at the CZ-1. It is quite sophisticated for such a small engine. Nothing is skimped. The engine is sturdily proportioned and made to the usual O.S. high standards.

To simplify starting procedure, the CZ-1 is equipped with a rear starting shaft and this, like the crankshaft, is ball bearing mounted. On the rear shaft is mounted a starter cone to which a conventional electric model aircraft starter can be applied. Alternatively, the engine can be hand-started with a pull cord, the starter cone incorporating a pulley for this method.

There is a third means of starting when the engine is supplied as part of a Kyosho kit. This, included with the kit, but not with engines purchased separately, is the Kyosho "Zip" starter, a rack and pinion device that enables the crankshaft to be spun over vigorously with one hand, while the model is held with the other.

Carburetor controls, useful as they may be to the expert modeler, are frequently a source of confusion and trouble to the beginner. Therefore, O.S. has cut them to the bare minimum on the carbure-



Despite "beginner" label, new CZ-1 features Schnuerle scavenging, ABC piston/liner assembly and high quality construction throughout.

tor fitted to the CZ-1. There is a single set-screw to enable the engine's idling speed to be maintained when the throttle is closed, but the long familiar needle-valve, in the form that we usually recognize it, is missing.

Strictly speaking, the CZ-1 carburetor does incorporate a type of needle-valve. It is, after all, difficult to imagine a more practical solution than a needle-valve to the problem of setting up a small carburetor to deliver, precisely, the minute amount of fuel (the ratio is about 1 part of methanol base fuel to 9 parts of air by weight) required to make a 2cc charge of combustible gas. But whereas, in a conventional model engine, the needle-valve will allow the user, deliberately or accidentally, to feed the engine with anything between a vastly excessive amount of fuel and nothing at all (neither of which will enable it to run) the CZ-1's needle is

(Continued on page 68)



The all-new four-wheel-drive Kyosho Stinger also features the new CZ-1 as part of its standard equipment.

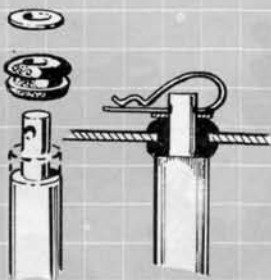
Pit Tips

by JIM NEWMAN



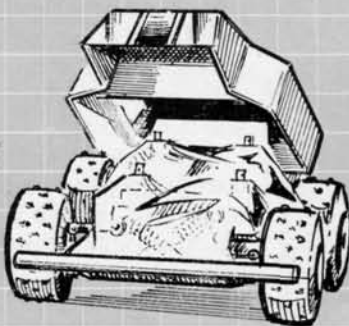
Lost your body clips? Obtain a couple of bobby pins (hair grips), then cut as shown.

Billy Brown, Queens Village, New York



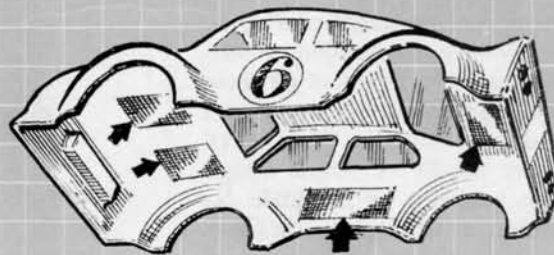
The constant stress placed on body-mounting points by impact, roll-overs, etc., is frequently the cause of cracking around those points. It helps to totally isolate the body from the chassis by means of flexible mountings, and rubber grommets are readily available from Radio Shack. Open out the holes in the body, then insert a grommet at each mounting. It might also be necessary to trim the mounting posts, shown dotted. Use a washer on top of the grommet before inserting the body clips.

Ken Medows, Justice, Illinois



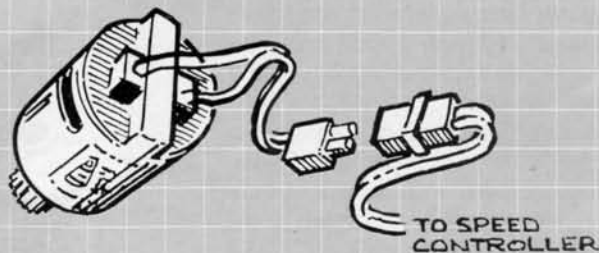
To keep dirt off the speed controller, etc., this owner drapes plastic wrap over everything before attaching the bodywork, which then holds the plastic in place.

Sathy Bhavanandan, Hershey, Pennsylvania



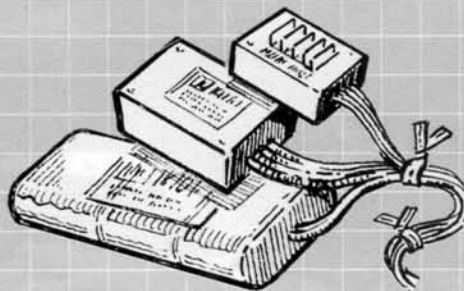
As it is customary to paint transparent bodies on the inside in order to avoid chipping, any contact with the frame or components will soon rub holes in the paint. To avoid this, determine where the contact points are, then apply patches of vinyl tape or duct tape to prevent chaffing the paint.

Brent Sanders, Lancaster, Ohio



When field servicing your cars, quick-change motors are a big plus. Install Tamiya connectors in the motor leads. If you put the male plug on the motor leads, you'll be able to plug directly into the battery for no-load testing.

John Mundy, Kannapolis, North Carolina



The twisted mess of wires under the bodywork, apart from the poor appearance, leads to fatigue breakages due to constant movement. Use baggie twist-ties to capture those wires into tidy harnesses.

Brad Winsor, Auburn, Alabama

Radio Control Car Action will give a free one-year subscription (or one-year renewal if you already subscribe) for each idea used in "Pit Tips." Send rough sketch to Jim Newman, c/o Radio Control Car Action, 632 Danbury Rd., Wilton, CT 06897. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO, AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we cannot acknowledge each one, nor can we return unused material.

Custom PAINTING

by PHIL SROKA



Needed equipment: Airbrush, compressor, respirator, scissors, X-Acto blades.



Materials: 3M Fine Line tape, Parma paint, R&M Prekleano, MRC's Fox body.



Body trimmed, windows taped, and ready for design.

THERE ARE quite a few of you out there who have been airbrushing Lexan bodies throughout this last season and getting pretty good at it. But sometimes it's a little hard to come up with something new and different so I'm going to give you a few tips on designs and techniques to help you get that paint job you've always wanted. For this article I'll use MRC/Tamiya's* Fox buggy body. The same techniques can be used on any body you might choose.

Before you begin taping, you'll want to cut the body out and make all mounting holes. This way you'll get a better perspective of what the car will look like so you can make your designs. Don't worry about getting paint on the outside as it can easily be removed with alcohol when you're finished.

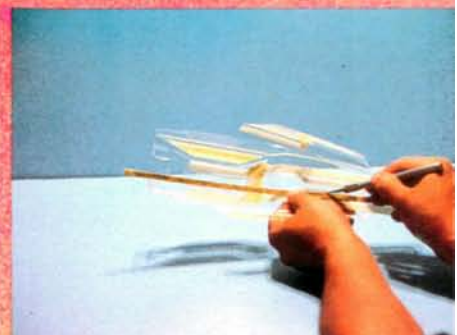
Once trimmed, place the body on the car to check to see that it clears all wires, shocks etc., which will be easier to see now while the body is clear. If you don't do this, all your hard work could be rubbed off later.

Now that the body is fitted, wipe out the inside with R&M Prekleano, which is available at automotive paint supply stores. It will remove all oils or residue before taping that might cause the tape to lift prematurely.

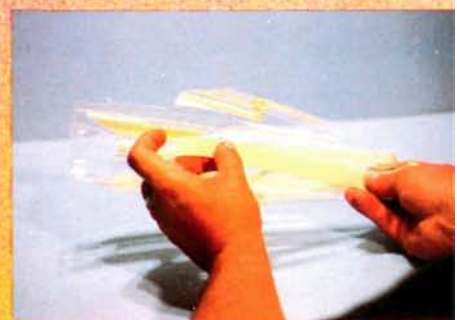
For taping, 3M Fine Line tape is a must! It comes in an assortment of widths down to 1/16 inch. It can handle curves and leaves the cleanest lines of any tape. You can also purchase this at auto paint supply stores.



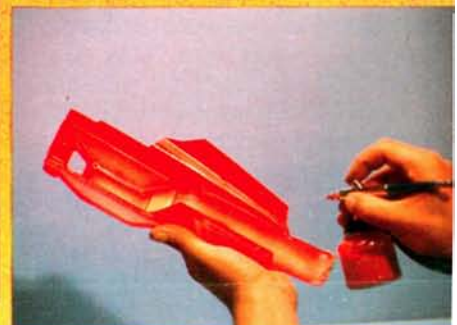
An easy way to start design is to run one or two lines from the front of the hood to the back of the roof.



For side designs, accent existing body lines for better results.



Before painting main color, tape off areas not to be painted.



When painting main color, be sure to get in both sides of the body.

It's easy to achieve that awesome paint job!

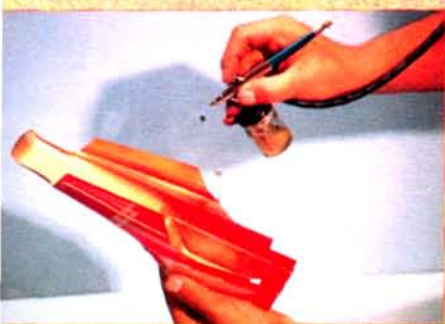
AIRBRUSH TIPS



Practice various types of fade painting on paper before attempting body.



When doing fades on body, be sure to keep them even.



Complete fades by adding a second color.



Remove window masking after painting is com-



A truly magnificent finish that will create a lot of finger pointing at the track is not as hard as you might think.

Begin by taping windows. When this is done you're ready for your designs. Begin with the hood, which is the heart of the paint job. Now you can take advantage of the different sizes of Fine Line tape.

I sometimes find that running one or two lines from the front of the car through to the end of the roof will give you a start for your design. These stripes can also be used as a guide of the center of the body to keep your design even from side to side.

Don't go crazy by putting stripes all over the car. I've found that you will get the best design by following the body lines and accenting them; this is where you can use the different width tapes to get the desired effect. If any tape has to be trimmed, use a new X-Acto blade so you won't have to apply as much pressure and you'll get a good, clean edge. If you wish to change the shape of a stripe, such as making it come to a point, use a guide such as a small steel rule or a thin piece of metal. This way the cut will be perfectly straight.

Now it's time to mix paint. I've always used Parma* paint with great results. Once you've chosen the colors you wish to use, mix one part paint to one part thinner. If you want to add a little sparkle to the paint, you can add a little Parma No. 710-B Silver Metal Flake powder, which always gives the color that custom look. When using a 2-ounce airbrush jar,

only use a small amount, about the size of a pencil eraser. A little bit goes a long way. Don't forget to shake thoroughly.

Now go over the body, pressing all of the tape down with your finger and making sure you get the spots where the tape crosses over, or in body creases. You can use a dull pencil for this. Once this is done, wipe out the inside with Prekleano.

Before you begin spraying, set up an airbrush jar of thinner or rubbing alcohol for cleaning between colors. Set the compressor to about 35 pounds pressure. If you're using flake powder, shake the color thoroughly. You'll have to do this every time you begin spraying this mixture to keep the particles suspended in the paint.

Paint your main color first and when using flake powder you must spray one or two very light coats to get the particles distributed evenly, then spray a few more coats until covered. Once the main color is painted, you're ready for stripes.

One trick to get some really wild stripes is to use a series of shades from one color to another. To do this, get a piece of paper to practice on before shooting the car. Take a thin piece of cardboard, a business card works best. Take the desired color and adjust the airbrush so that it just barely shoots a spray. Put the card flat on the paper and spray along the edge with the brush

(Continued on page 88)

KO EXPO EX-5

R/C Electronics



FROM HOBBY SHACK

photo by ARCE STUDIOS

by CHARLIE KENNEY

THE KO PROPO EX-5 is one of a new series of pistol-grip radios built by the Kondo Kagaku Co., Ltd.* of Tokyo, Japan. You may remember that KO built the K-line series of radios for Kraft Systems some years ago. Kondo has joined Hobby Shack to build an exclusive line of car radios that will be serviced by Hobby Shack of Fountain Valley, California. Upon opening the styrofoam carton, the first thing that strikes you is the pistol-grip transmitter. It is rakish in appearance with smoothly flowing lines and modernistic styling; and the receiver is very small.

The set as it arrived consisted of KT-287EX transmitter, KR-285A receiver, two PS201S servos, battery box with integral switch harness, extra servo horns, frequency flag and instruction manual—quite an array of hardware for the price. The set also is offered in three versions, the standard, mini, and racing. The racing version is more expensive because it includes a CX-11R MOSFET speed controller. The features of the KO Propo EX-5 follow.



Business end of the KT-287EX transmitter. Note RF section at center, control circuits underneath.

Transmitter—KT-287EX

- Advanced pistol-grip design for excellent balance on all 3 axes
- Thumbwheel control of steering rate
- Push-button reverse switch
- Adjustment panel with see-through dust cover
- Easy-to-read calibrated transmitter voltmeter
- Wiring for NiCd battery pack installed

Receiver—KR-285A

- Micro-size receiver
- Narrow bandwidth
- Molded three-pin connector
- Excellent range and interference-rejection

Servos—PS-201S

- Long-life motors and pots
- High torque and speed
- Water-resistant
- Synthetic resin gears

The particular system I received for review operated on Channel 3 27.095 MHz using an orange-coded frequency flag. Beginning with the transmitter—the heart of any radio system—and front panel controls, center, there is the steering wheel with clockwise movement right, and counterclockwise left. The steering trim control is just above the wheel and throttle trim (trigger) is to the right of the wheel. Moving on to the right, there's the battery indicator with a divided scale,

green to right, orange to left. When the battery indicator falls into the orange area, it's time to replace the batteries if you're using alkaline cells or recharge if you're instead using NiCds. Below the



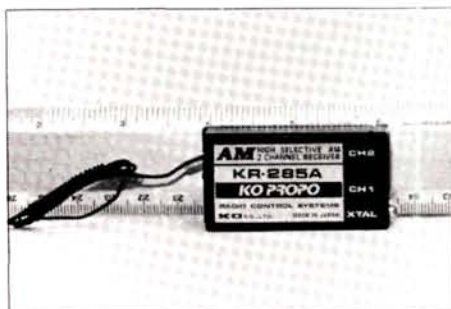
Adjustment panel with dust cover removed. See text.

battery meter is the slide-action On/Off switch; left is off, right is on. A charging jack is directly below the switch on the underside of the transmitter.

To the left is the throttle trigger. It is a dual-action control with the trigger moving forward for braking or squeezed for full speed. Braking is by means of the reverse button just to the left and above



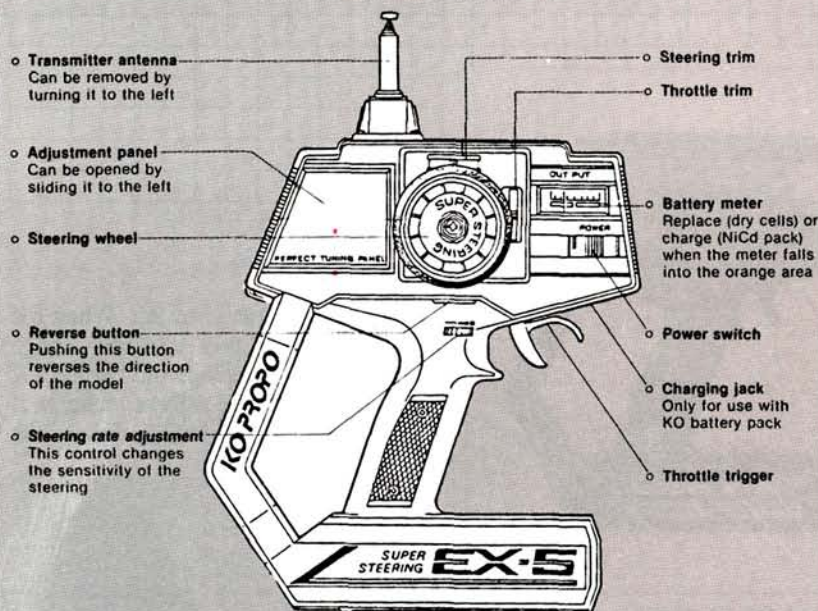
Full-up KO/Hobby Shack Expo EX-5 system as it arrives from the factory.



Small size of receiver is apparent next to scale above.

photos by SUE KENNEY

TRANSMITTER



TRANSMITTER—KT-287EX

- **Style:** Pistol grip
- **Available frequencies:** 27 & 75 MHz bands
- **Output power:** Maximum 500 mW
- **Power:** 9-12V DC, alkaline or NiCds
- **Current consumption:** 160 mA @ 10V
- **Pulse width:** 1.85 plus or minus .5 ms
- **Size:** 9 $\frac{5}{8}$ x8x3 $\frac{1}{2}$ inches
- **Weight (dry cells):** 1 $\frac{1}{2}$ pounds

RECEIVER—KR-285A

- **Type:** Single conversion amplitude modulation
- **Available frequencies:** 27 & 75 MHz bands
- **Power:** 4-6.5V DC, alkaline or NiCds
- **Current consumption:** 10 mA @ 6V
- **Dimensions:** 5 $\frac{7}{8}$ x2 $\frac{3}{16}$ x1 $\frac{1}{16}$ inches
- **Weight:** 1 ounce

SERVOS—PS-201S

- **Travel angle:** plus or minus 45°
- **Torque:** 45 inch-ounces
- **Speed:** 0.3 sec/70°
- **Dimensions:** 1 $\frac{7}{8}$ x2 $\frac{1}{8}$ x1 $\frac{3}{16}$ inches
- **Weight:** 2 ounces

the trigger. By pressing or blipping this control with your left thumb tip you can slow the car while still holding full trigger. This is a great feature for racing.

Below the reverse button is the steering-rate control. Adjustment of this control is accomplished with the left thumb. It's used to change the sensitivity of the steering function equally in both directions. The steering servo should be installed and adjusted with the steering rate at its highest position (counterclockwise). The steering throw can then be reduced by moving the control in a counterclockwise direction until the proper throw is achieved. Needless to say, the control can be varied while your vehicle is running.

The last series of controls are under an adjustment panel on the top of the transmitter. To gain access to the controls, the cover must be removed by sliding it to the left.

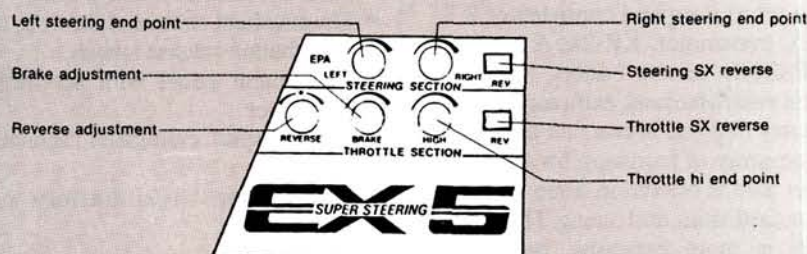
The controls, starting with the upper left and moving clockwise, are as follows:

- **Steering EPA (end-point adjustment)**
These controls allow the maximum movement of the steering servo to be set in each direction separately. This is used to compensate for models that do not steer equally well in both directions.
- **Left steering end-point**
Adjusts the maximum point the steering servo will travel to the left of neutral.
- **Right steering end-point**
Adjusts the maximum point the steer-

ing servo will travel to the right of neutral.

- **Throttle and Steering reversing-switches**
Allows assembly of the linkage of the servo systems of both channels regardless of the rotational direction of the servo motors. Rotation of each servo motor can be set to either direction with the switch for the throttle and steering.
- **Throttle high-end-point**
Adjusts the maximum high-throttle position.
- **Reverse adjustment**
Sets the reverse or low position for the throttle servo.
- **Brake adjustment**
Adjusts the maximum position of the throttle servo for braking (usually less than the reverse position).

ADJUSTMENT PANEL



This completes the description of the transmitter controls. Rounding out the transmitter is a 10-element 32-inch whip antenna and an externally removable crystal on the back of the unit. The eight transmitter batteries are located in the base of the transmitter. NiCds can be substituted for alkaline cells, but an appropriate charger must be obtained with suitable connectors. Hobby Shack can provide a charger and wiring harness. In addition, there are many accessories available for the KO Propo EX-15 system, including two other type servos, transmitter and receiver NiCd packs, three different speed controllers, and a battery-eliminator circuit (BEC)—enabling the vehicle radio system to run off the 7.2-volt car pack—and various servo-cable straight and Y extensions.

(Continued on page 88)

The Starting Line

by the RADIO CONTROL CAR ACTION STAFF

This question/answer format is designed for beginners and will attempt to answer questions, correct misconceptions, and generally ease entry into the rapidly growing hobby/sport of R/C cars. We welcome your questions, as answers to representative questions will help other beginners. Direct your questions to "The Starting Line," *Radio Control Car Action*, 632 Danbury Rd., Wilton, CT 06897.

How's your R/C car today? Got the blahs because you haven't done anything new with it lately? Here are some ideas to shake you up and put new life in your hobby.

Q.

I don't like to race at a local track. Can I set up my own race course?

A.

There's no law that says you can't! Do you have a vacant lot near you? Clean it up (with the owner's permission) and lay out a course you like. Take your friends along for the job. Later, they can join you for informal races. That's a great start, then let your imagination take over.

Q.

What can I do to my car to make it different?

A.

How about a fancy paint job? Buy an extra body and decorate it as if it were one of those custom full-size vans. Use plenty of metal-flake paint, because it really stands out when shining in the sun!

Q.

Anything else to jazz up my car?

A.

How about working headlamps? Using miniature lamps from model railroading supplies, you can make your buggy or street car light up! Did you think of adding working brake lamps or turn signals? There are blinking circuit kits you can buy at electronic stores or hobby suppliers.

Q.

I have a buggy and a "car crusher" truck. How can I use them together?

A.

One of the more popular ways is to make a car trailer; you'll end up with your truck pulling your buggy racer on a trailer to the next race! Or how about using your buggy to pull a boat trailer with your favorite R/C boat mounted up? Got more ideas? Send them in!

Q.

Nobody makes the car body I'm looking for. How can I get somebody to make one?

A.

Some types of industries regularly use vacuum-forming machines to make prototypes of a product they wish to mold. Also, some airplane modelers use such small machines to make their own parts for airplanes. If you find someone with such a machine, the next step is relatively easy. Get a plastic model kit and size it up to fit the chassis you have. The machine operator will use the outline as a male mold to shoot the polycarbonate body for you.

Ideas for putting new life into your hobby.

Q. How can I build my own chassis?

A. I'd suggest using fiberglass as a basic material for any prototype chassis. It's easier to cut and readily available, more so than sheet aluminum, and more affordable too. After cutting it to shape, use manufactured car parts where possible to make the chore of suspension assembly a lot easier.

Q. Could I turn my car hobby into a money-making enterprise?

A. It's been done before; and if you make a good product or offer a good service, the modeling fraternity will welcome you. Better yet, why not help others? Maybe you can help sponsor or participate in an R/C car race or exhibition to aid a worthwhile charity?

Q. Are there different types of events I can enter my car in?

A. There sure are. One example is the mud-bog race for monster trucks. How about a hill climb? It's a real challenge for man and machine! How about drag racing? Any kind of car will do if you don't want to build something special. Don't forget endurance racing. It will test your stamina, pit crew, and the durability of your machine. Almost anything full-size cars can do, our R/C cars can do too!

Q. Are R/C cars suitable for a seven-year-old?

A. A lot depends on the abilities and maturity of the child. Is this child mechanically inclined and adept? Does the child act responsibly and take care of his or her belongings? R/Cing has the potential to be a serious hobby with which any child or adult can grow. If the child in question also is coordinated, and the answer to all the previous questions is yes, then proceed cautiously with an R/C car purchase. A seven-year-old might do better with one of the more inexpensive entry-level cars put out by Shinsie, Ertle, and Radio Shack.

Q. I built my R/C car, but I can't make it run right. Where do I go for help?

A. Try the hobby dealer from whom you bought the car. Some shops not only offer over-the-counter help, but may actually run a repair service. A local modeler or a club can be of assistance. Call the car manufacturer or distributor. They can often "talk you through" a repair and might offer some sort of repair service as well. Keep in mind two things: don't ask a car manufacturer to assist you too much when you have a problem with the R/C system itself and not with the car, and expect to pay for these services if they find misassembly or misuse the source of your problem.

Q. Are electronic speed controls in my electric car a good idea?

A. I'd say yes if you're having a lot of problems with a mechanically operated speed control. An electronic speed control eliminates the throttle servo and the receiver battery in most cases, so your car will have less onboard weight. When buying a speed control, get one that is compatible with your R/C system. If you're into racing, a control with forward-only/braking is ideal, while one with forward/reverse is best for all-around fun. ■

The Pole Position

by RICH HEMSTREET



THE DAYTONA 500. In the United States, there are two major auto races. The Daytona 500 and the Indianapolis 500 each draw national media attention and huge crowds. While the cars are totally different, the basic race format is identical—the cars go flat-out for 500 miles on oval tracks. Many R/C road racers think ovals are boring, usually because they've never run one.

Oval track racing is going in all scales of radio-control racing. Both 1/12- and 1/10-scale on-road cars are running more oval races. In Orlando, Florida, Lake Whipoor-will International Speedway features a high-banked, concrete oval track for both 1/12- and 1/10-scale cars. The 1/10-scale off-roaders are running both stock cars and sprint cars on dirt ovals. Even the 1/8-scale racers are starting to run some ovals. Virtually all of the growth in 1/4-scale racing revolves around oval track racing, both dirt and pavement.

What are some of the reasons for this growth? On an oval track, there is a lot of exciting wheel-to-wheel racing. The cars don't seem to get as strung out. There is always traffic on an oval. You have to be able to pass on the track, because drivers don't crash as often. If you do crash, you're a lap down right away. If you're in the lead, you can't let up, because everyone can catch up if you make just one mistake.

Oval-track racing is flat-out racing. Because of the Daytona 500 and Indianapolis 500, most spectators readily identify with oval-track racing.

R/C Stock Cars

Preparation Is Important

The high speeds and sometimes hard wrecks of ovals require a bulletproof car. Preparation is important for any racing, but vital for oval tracks.

While there are only left-hand turns, handling is crucial. You have to be able to get through the turns on both the inside and the outside. If you don't handle well, you won't win. If your car only handles on the outside, everyone will cut inside of you and pass. If your car only handles on the inside, you won't be able to pass the guy in front of you except on the straights.

So how do you set up for an oval? First, you have to get the right tire combination. You can also offset some of the weight in your car. Battery packs can be moved to the left. You can shift too much weight to



The 1986 Monte Carlo is the hottest car on the NASCAR circuit this year. Currently available in clear Lexan from Parma.



Make your own oval-track killer with MRP's Pontiac 2+2, available in 1/10- or 1/8-scale.

the inside. You don't usually want more than 60% or 65% of your weight on the left side. The larger the radius of the turns compared to the length of the straights, the more that can be gained with the weight offset. An oval track with tight turns and long straights will favor a balanced road-race setup.

You can also use tire stagger. That is where you put larger diameter tires on the right side than on the left side of your car. In the front of the car, stagger will transfer weight to the left rear tire. This will help give better traction on the turns. Rear stagger will really only have a good effect if you are running a solid rear axle without a differential. Then rear stagger will work to help you through the turns.

The right side springs can be stiffened

to counteract the weight shift from hard cornering. The toe-in/toe-out is very important. You have to be able to go straight and stay off the walls. I've used both toe-in and toe-out successfully. If you can adjust caster on your car, that also will slow down the steering to keep you off the walls. And you can turn down the steering rate on your transmitter so that you don't overcorrect on the straights.

On high-speed ovals, aerodynamics will also make a difference. Spoilers can help keep a car going in the right direction, especially with the 1/8- and 1/4-scale cars. *Radio Control Car Action* will feature a series this year dealing with aerodynam-

ics in R/C car racing.

Stock Car Bodies

As the Daytona 500 is in the news, stock car racing comes to the fore. The charts show the stock car bodies available to us.

Next time we'll look at the open-wheel bodies that are on the market.

If you haven't run an oval race yet, try it; but be careful—it could become an addiction.

New Stuff On The Market

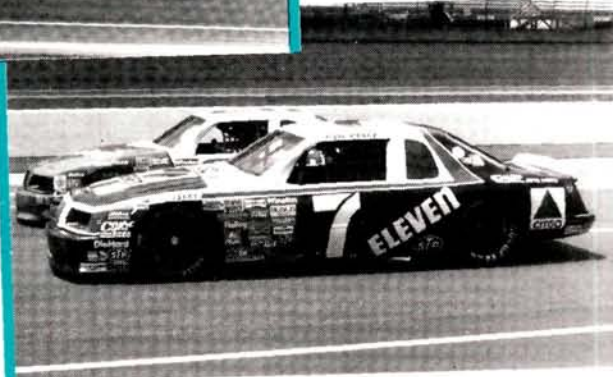
Bolink has come up with a new independent rear suspension for their 1/10-scale Invader. This is designed to give the car more traction for off-road and especially



Above: Just as in R/C oval track racing, No. 89 pulls into the pits, the rest of the cars roar by. Below: This full-size NASCAR stocker anxiously waits to qualify.



Left: Full-size oval racing provides wheel-to-wheel competition. Here Cale Yarborough and Dale Earnhardt battle for position. Below: Neck-and-neck challenges as seen here in full-size are just as adrenalin-producing in scale R/C stock car racing.



AVAILABLE STOCK CAR BODIES

Grand Nationals	1/12	1/10	1/8
BoLink*	'83 Ford T-Bird, '86 Buick	'83 Ford T-Bird, '86 Buick	
MRP*	Chevy Monte Carlo, Buick Regal	'86 Pontiac 2+2, Chevy Monte Carlo	'86 Pontiac 2+2, Chevy Monte Carlo, Ford T- Bird GT
McAllister*	'85 Olds, '86 Olds		
Parma*	'86 Chevy Monte Carlo, '83 Pontiac	'86 Chevy Monte Carlo	
WCM* 1/4-scale: Ford T-Bird, '86 Chevy Monte Carlo.			

ASA—Outlaw —Old Timers	1/12	1/10	1/8
BoLink	'55 Chevy, '76 Olds, ASA Camara, NDRA Firebird Wedge	'55 Chevy, '66 Mustang, Dirt Corvette, ASA Firebird, NDRA Firebird Wedge	
MRP	'82 ASA Camaro	'83 ASA Camaro, Outlaw Wedge, ASA Capri	Firebird T-A, Camaro Z-28
Parma	ASA Mustang, ASA Dodge	ASA Mustang, ASA Dodge, ASA Buick, '65 Mustang, '67 Pontiac, '69 Dodge, Outlaw Wedge	
McAllister		'85 Corvette Outlaw, Wedge Vette Outlaw, Outlaw T-Bird	

dirt oval-track racing. The Invader also is now being made available as a 1/10-scale gas-powered car. This should prove to be a really quick package.

Advance Engineering* has come up with a new 1/12-scale electric funny car, the Drag'n. Advance also is marketing reworked Associated* plastic rims for the RC-500. These rims permit the use of Advance's line of MRC Grand Prix tires on most 1/8-scale cars. That way, a racer can have several sets of MRC tires mounted for a race or testing.

Associated's new 1/12-scale car, the 12L, should be available. The car has independent coil springs for the front suspension; no more monoshock.

Presently, there is at least one 1/10-scale on-road car on the drawing boards and one new 1/12-scale car being worked on. So, stay tuned for the next issue.

Rich Hemstreet, c/o Radio Control Car Action, 632 Danbury Rd., Wilton, CT 06897.

**The following are the addresses of the companies mentioned in this article:*

Bolink R/C Cars, 420 Hosea Rd., Lawrenceville, GA 30245-4695.

Model Racing Products, 18676 142nd Ave. N.E., Woodinville WA 98072.

McAllister Racing, 4827 Top Circle, Simi Valley, CA 93063.

Parma International Inc., 13927 Progress Pkwy., N. Royalton, OH 44133-4394

WCM, Inc., Rt. 2, Box 207A, Buffalo, TX 75831.

Advance Engineering, P.O. Box 766, Woodland Park, CO 80866.

Associated Electrics, 1928 E. Edinger, Santa Ana, CA 92705. ■

1/4-SCALE GRAND NATIONAL CARS

The WCM Grand National 1/4-scale replica kit comes complete with every bolt, nut and part that is needed to race the car. You need only to add your radio components. After assembly top off the fuel tank with 50:1 gasoline and oil mix and start the engine with self contained recoil starter. You are now ready for the thrill of your life. Your race car sits idling awaiting your command. Slowly advance the throttle and the WCM precision clutch smoothly rolls the racer onto the track. Wait no longer to own the **ULTIMATE** race car.

SPECS: 48" long, 18" wide, 13" high, race ready about 30 lb



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Grand National Kit—Available with: T-Bird or Monte Carlo SS slopewindow body \$1,175.00 (no radio)

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- Heat treated sway bars front & rear
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- Independent front suspension—fully adjustable
- Five link rear suspension—fully adjustable
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- Spun aluminum wheels
- Burns gasoline & oil mixture
- Includes tuned expansion chamber
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Track Report

by FRED MURPHY

PROJECT PART II



Grasshopper

We've transformed the docile Grasshopper into a lethal predator!



The transform Left, the Grasshopper its stock Below, the highly modified version ready to eat up competition

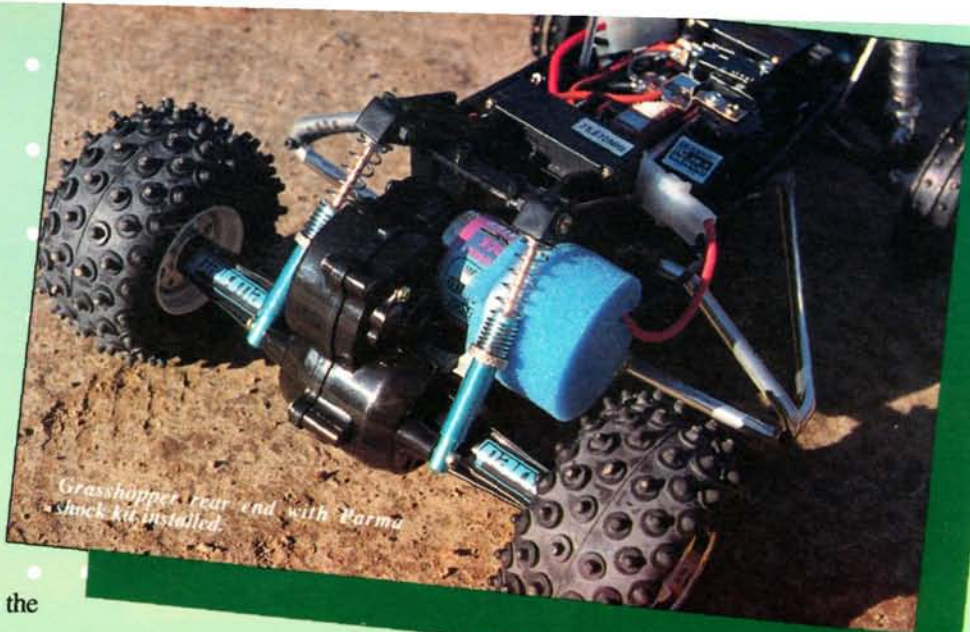
NOW THAT YOU'VE had some time to get familiar with the MRC/Tamiya* Grasshopper, let's take a journey from an out-of-the-box kit to a production-class dirt stomper. In *part 1* (Winter '87 issue), I discussed the

Grasshopper's great market acceptance, and growth capability. Now, with the help of MRC, Parma International*, Custom Racing

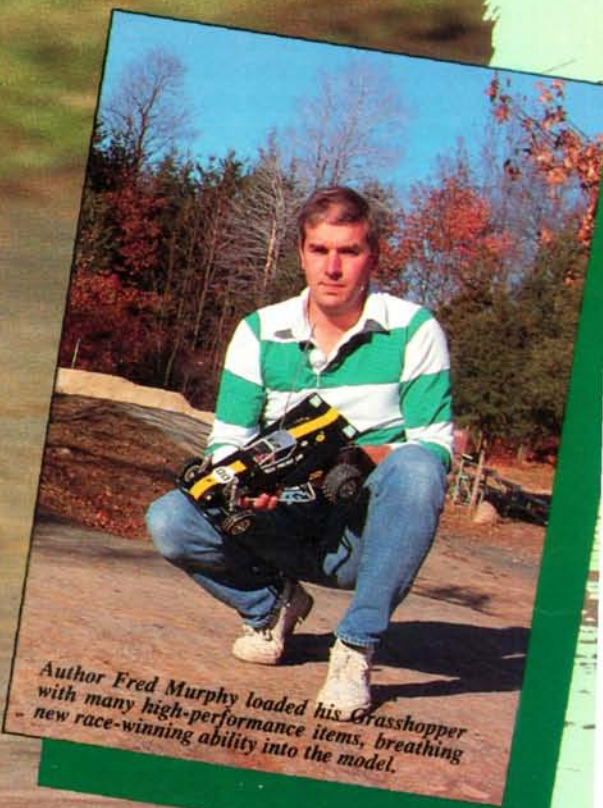
Products*, and Pro Line*, you'll see the Grasshopper transformed from the innocent to the awesome.

The first area of attack is the gear box. I replaced all the 5-mm gear box bushings with ball bearings to achieve the drastically reduced friction needed for higher rpm. Along with adding the bearings, the utilization of Parma's lightweight rear axles (No. 12210) and aluminum rear hubs (No. 12110), the stock Grasshopper gear box showed great freedom of movement on the workbench. To provide the power plant complement for the gear box changes, I used the

1/10-scale Yokomo stock motor from Parma (No. 10815). I selected this motor because of its popularity in this area. Also, keep in mind that we're working with a production-class car and the basic R.O.A.R. rule limits the retail value of a motor to \$25. Under this guideline, you'll be working with motors like the Yokomo, Associated, Kyosho, and Trinity stock sealed motors. That's not to say that one motor is better than another, but that they'll



Grasshopper rear end with Parma stock kit installed.



Author Fred Murphy loaded his Grasshopper with many high-performance items, breathing new race-winning ability into the model.



Roller bearings should be a premier consideration for any serious competitor.

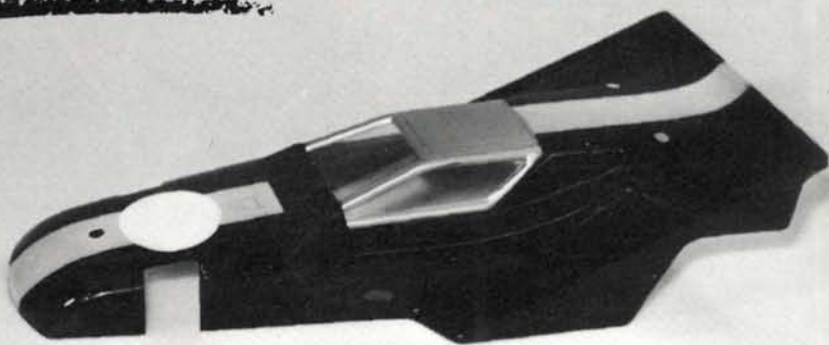
all be designed for different speed, torque, and rpm requirements. Inquire at your local racing facility as to what motor performs well there.

After completing the drive train reassembly, adding double pin connectors at the point of contact between the motor and the speed control is always nice for ease of engine removal for cleaning and repairing the car. I also protected the motor's end bell with Parma's cool filter end bell dust cover (No. 11011) to keep as much dirt and dust as possible away from the motor.

Before attaching the gear box back onto the chassis, my next point of interest was the front suspension on the Grasshopper. Custom Racing Products has designed a very nice modification to give the Grasshopper that extra front suspension flexibility often needed in racing situations. By using the CRP Hornet/Grasshopper front shock kit (No. 1556) I easily converted the suspension into a great looking and performing system. I simply removed the old shock towers, drilled two holes, bolted on the new lightweight aluminum shock tower, and added the oil-filled, coil-over shocks for an outstanding performance addition to the Grasshopper. Once I'd made the front suspension changes, I reattached the gear box using the stock mounting points.

I made one rear suspension change. I took the stock friction shocks and replaced them with Parma rear shocks and progressive rate springs (Nos. 12610 and 12641) and gave the rear suspension the same performance flexibility I had added to the front. These oil-filled shocks and coil-over springs allow the maximum spring tension and spring rate adjustment for any kind of racing condition.

The next upgrade on the Grasshopper is the speed control. There are many types of after-market speed controls available today for overall performance and econ-

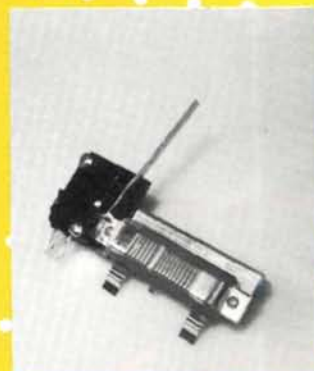


The aerodynamic Parma Stinger body gives the modified Grasshopper as much "show" as "go."

Right: CRP's lightweight aluminum shock tower bracket and oil-filled coil-over shocks. Below: Pro Line universal front bumper.



Right: Yokomo .05 stock motor from Parma. Below: Parma front-spiked tires mounted on CRP chrome wheels.



Parma's ceramic resistor speed controller with reverse.

The Parma speed control cleanly fits into the Grasshopper's stock controller space with minimal soldering and a piece of double-faced tape that is supplied with the unit. It's a great all-around performer and virtually maintenance-free.

Once the Parma speed control was in place, I had to relocate the radio's receiver to the area where the receiver battery box was located. By the way, this speed controller allows the elimination of the receiver batteries, thereby reducing the all-up weight.

(Continued on page 78)

omics. I chose the 1/10 ceramic resistor speed control from Parma (No.11517). Incidentally, this unit does have reverse but if you prefer not to have it, part No. 11515 will satisfy your requirements.

Spare-Parts Stockers

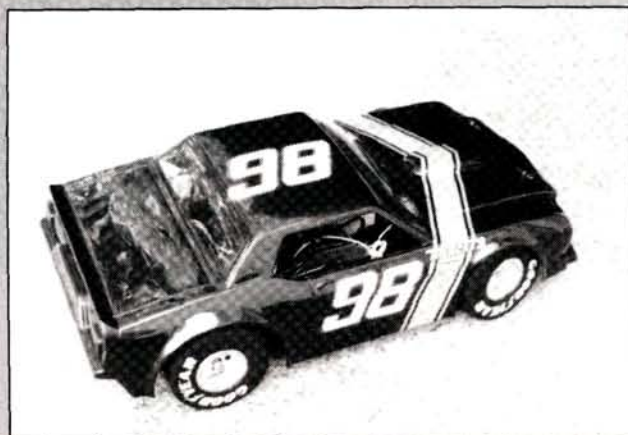


Create your own NASCAR—inexpensively! !

by Eric Goldschrafe

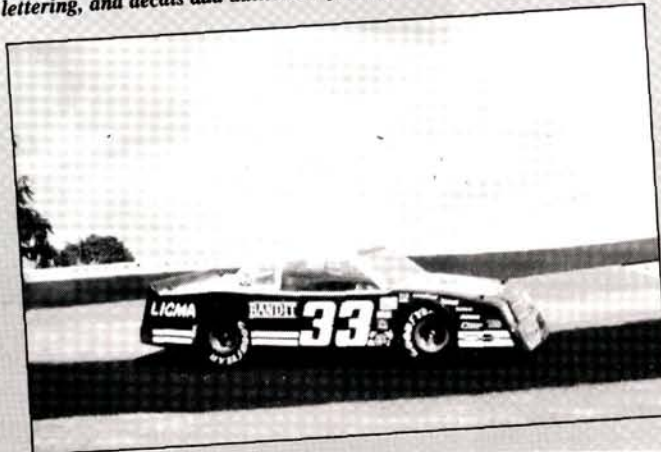
OVAL-TRACK auto racing takes on many forms, but the most popular are the NASCAR Winston Cup stock cars. This technicolor from of rolling thunder is repeated on a lesser scale at hundreds of short tracks all over North America, where various types of late-model stockers entertain local crowds on Saturday nights. Models of these cars can be as colorful and diverse as the full-size cars, and in many cases, may be built from spare parts or worn-out off-roaders. Several examples are shown, primarily to illustrate how easily production parts adapt to some relatively simple hand-made components.

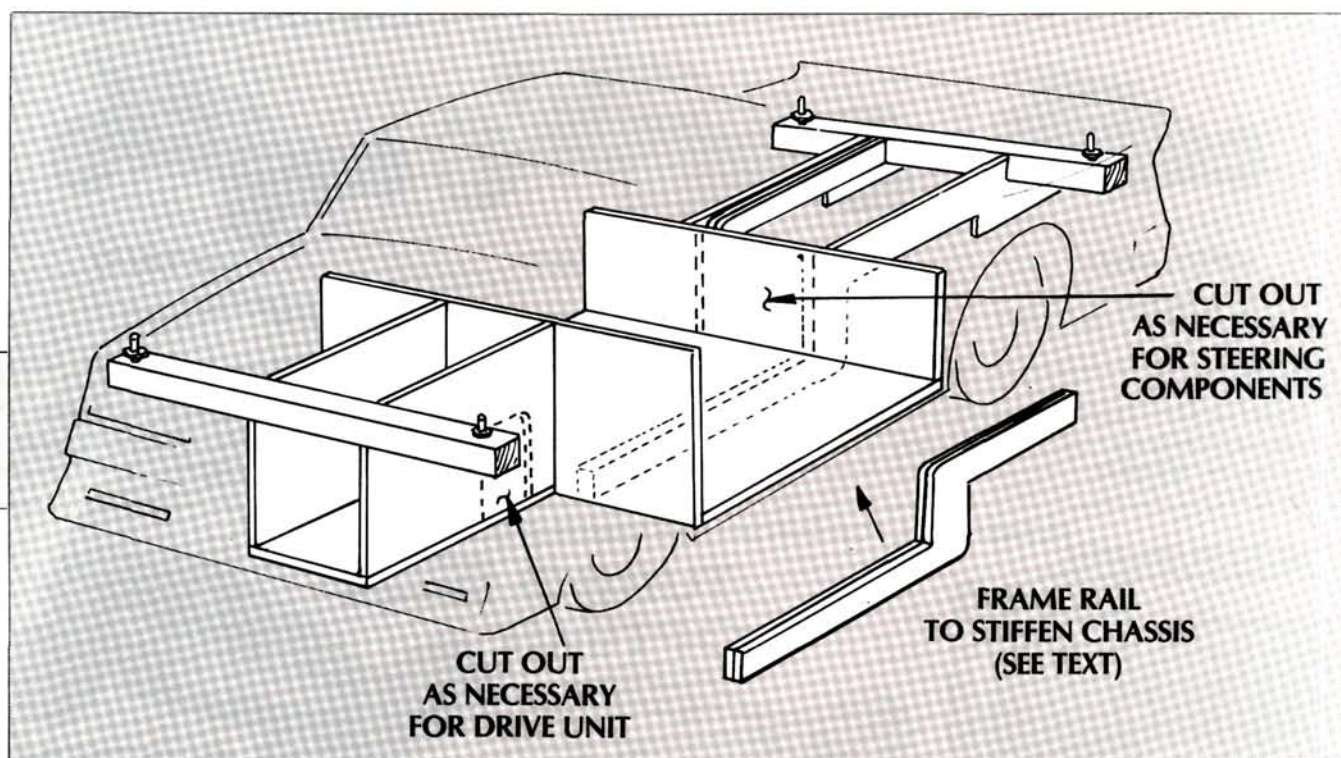
The easiest way to start one of these is with an unpainted body (any stocker-type will do). Figure out what the wheelbase will be (that's the center-to-center distance between the front and rear wheels) on the *body*, not the chassis. Most of the stock car bodies are about an inch longer in wheelbase than most existing chassis, but you'll find that the extra length just makes a hot car easier to drive. By laying the clear body over a sheet of graph paper, you can sketch out the outlines of the typical chassis shown in the drawing and the photos. Next, lay the mechanical components in place on your sketch and figure out how you could mount them to the chassis. For instance, some components, such as old 1/12-scale parts (off a "pan" chassis) will bolt flat to the bottom piece, and a Frog front end will bolt to the vertical section, if you keep the chassis front end narrow. Try to keep the tires from sticking out beyond the body, and remember to leave room for the front wheels to steer and for any



Short-track Mustang (painted to resemble Paul Mc Elearney's NASCAR) Parma body on home-made chassis with first-generation Tamiya 1/12-scale running gear. Combination of light weight, big gears, and Leisure .05 motor makes this one really hustle around a short track.

Parma Chevy on scratch-built chassis. Semi-prototype paint job, lots of lettering, and decals add authenticity and flavor to car.





suspension movement. Design the chassis so that the body mounts at the corners of the hood and rear deck lid—it looks more realistic, and the body will add some stiffness to the chassis.

The parts are cut from $\frac{1}{8}$ or $\frac{3}{16}$ -inch aircraft plywood (available at most hobby shops) and are epoxied together. Any areas that flex easily may be braced with $\frac{1}{4} \times \frac{1}{2}$ -inch spruce strips or sections of the plywood glued together to form compound shapes. You might think that wood won't be strong enough, but with that big Lexan body protecting everything, it's just about all you'll ever need. Figure out where all the hardware will

mount, and drill the appropriate holes. Any wooden mounting blocks or brackets should be mounted now; you might want to temporarily put everything on to see if it works before you continue. If you're pretty confident that all is ready, give the wooden assembly a coat or two of paint, preferably glossy. This will keep any water from soaking into the wood if you accidentally run through a puddle, and it provides a better surface for servo tape to stick to.

After the paint is dry, mount the front- and rear-end components, using washers where screw heads or nuts bear against the wood, to keep from chewing it up.

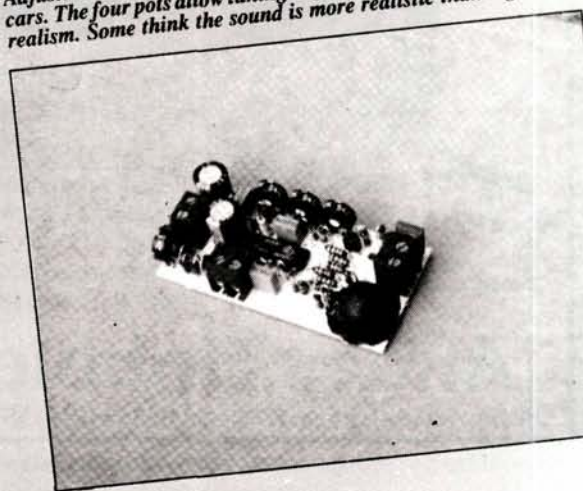
Look to see if all four tires touch the ground—if you goofed up and built a slight "tweak" into the chassis, use washers or spacers to shim the front or rear end into alignment. Try measuring the wheelbase on each side to make sure you've got everything on straight. You might have to elongate a couple of holes to get it right, but it's worth doing right. Mount the still-clear body (with the fenders cut open for tire clearance) and see that everything fits in. If there's a lot of room between the top of the tires and the body, you can add shims or spacers between the front- or rear-end parts and

(Continued on page 107)

Chassis detail shows front-mounted Kyosho electric plane motor and transmission; uses drive shaft to turn Tamiya truck rear axle. Note how everything but battery is located on right side, allowing heavier batteries to keep weight distribution on left.



Adjustable Robbe diesel sound unit for boats works fine in R/C cars. The four pots allow tuning to give that "small-block" Chevy realism. Some think the sound is more realistic than a gas car.



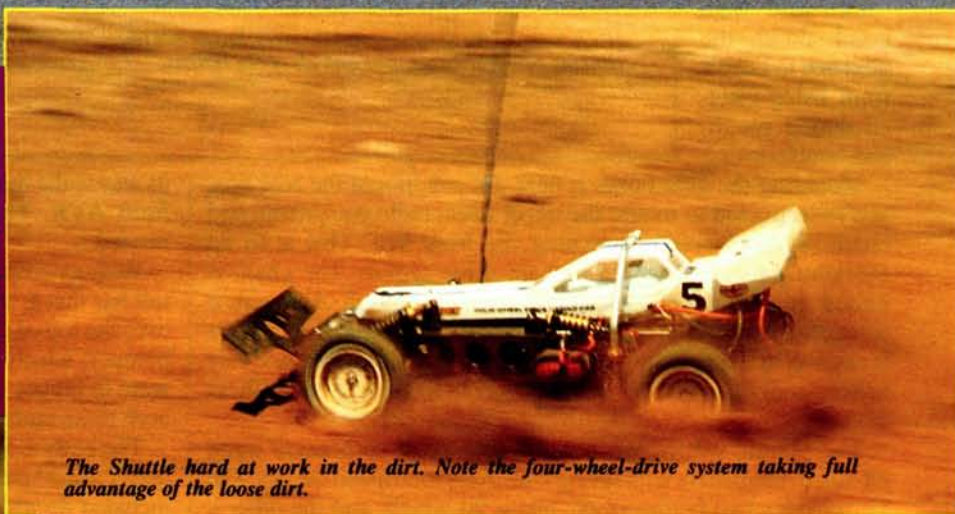
Track Report
AYK

Viper Shuttle

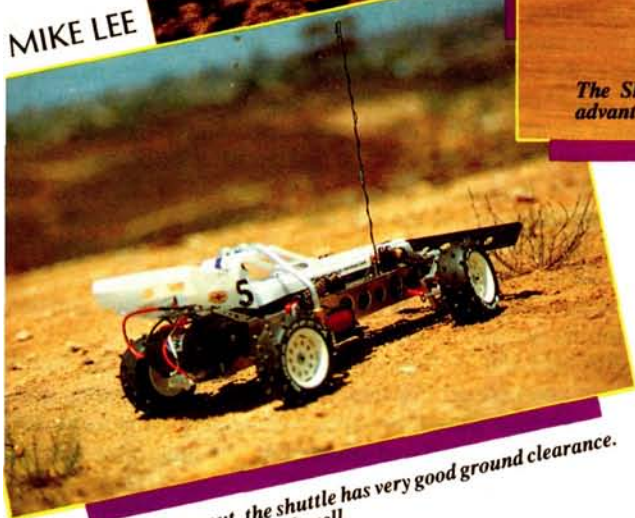


The latest weapon in
4WD R/C warfare.

MIKE LEE



The Shuttle hard at work in the dirt. Note the four-wheel-drive system taking full advantage of the loose dirt.



An effective layout, the shuttle has very good ground clearance. Heavily spiked tires work well.

THE BATTLE in the four-wheel-drive scene is one of superiority. No doubt, there are ingredients that you must have to be able to make the cut—speed handling and gut-wrenching power. Without one of these basic ingredients, you're not going to make it.

The designers at AYK have introduced their latest weapon in the all-wheel-drive battle, the AYK Viper Shuttle from Condor Trading Company International*. The Shuttle is a bodied version of the previous Viper, thus answering the basic need to protect the precious radio gear while negotiating loose-dirt conditions. The standard Viper was equipped with a roll-cage type body. The Shuttle's body not only protects, but looks good as well.

THE KIT. The Shuttle is a hefty vehicle. The frame is made of rigid

Viper Shuttle

stamped steel. A fiberglass top deck forms the backbone of the chassis, and attached to this assembly is a hard-charging 4x4 power gear.

ASSEMBLY. Construction of the Shuttle begins with the twin-differential-equipped gear boxes. The Shuttle has two gear boxes, forward and aft, to transfer power to the wheels. They are connected via a single ladder chain drive. The final drive gear ratios are similar. Each gear box is also equipped with a non-adjustable gear-type differential. The gear shafts are supported in Oilite bearings, and do require oiling during assembly.

Each gear box is made of heavy nylon-filled plastic with steel side plates. Assembly of the gear boxes is easy and should present no problems.

Moving to the chassis, the steering tiller and battery retaining strap are mounted. The battery strap is of coiled steel, bolted down on one side and held in place by a washer-head screw on the other. By loosening the washer-head screw, the mechanic can change out batteries and then cinch down the next one to keep it from being ejected during rough-and-tumble driving.

Mounting the gear boxes is next. As you mount the rear box, you're instructed to mount the upper deck, radio equipment, and chain retainers before mounting the front box. This is to tie everything together with the chain drive system. The chain is routed through the chassis so that it loops through. Although it contacts the chassis at some points, excessive wear at these points is nothing to worry about. A chain guard also is provided not only to keep rocks and dirt out of the chain, but to guide it smoothly as well.

The Shuttle suspension is a full four-point suspension using oil-filled dampeners with spring coil-overs to suspend the car. The kit provides two bottles of oil, one a 90-weight and the other a 30-weight oil. By mixing the two together in differing amounts, you can get an oil viscosity from 30- to 90-weight inclusive. I opted to make the combination a 50/50 mix, and found this to be too heavy. A better mix was 35% of 90-weight and 67% of 30-weight, rendering about a 50-weight oil. This should be about right for good dampening from the suspension.

The front suspension is actuated from twin trailing arms off of the front axles. There is no camber or castor adjustment. Action of the dampeners comes from the upper trailing arm, through the dampener to the upper chassis plate. The dampeners are inclined about 35° upward from level. Action on the suspension is positive with plenty of throw.

At the rear, there's a single trailing arm swinging from a steel suspension plate attached to the bottom of the chassis. The trailing

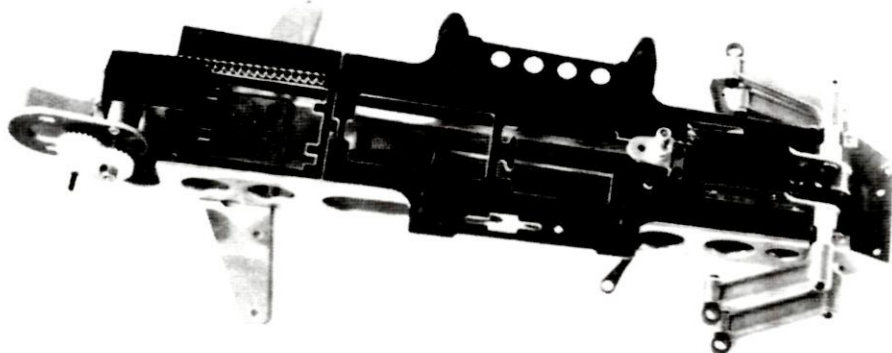
arm connects to its dampener via a ball link to the horizontally mounted dampeners. Swing arm action is adequate, providing more than enough throw to clear the chassis.

Transfer of motion is provided through standard dogbones from transmission to wheel. At the front, the dogbones are equipped with spring loads to allow telescoping. This is necessary to allow driving power when steering the car. It works out very well, and I've experienced no problems yet.

The tires are heavily spiked all-terrain knobbies. As the Shuttle has identical drive ratios from axle to rear axle, all tires and wheels are interchangeable. These tires work well in sand, loose dirt, light mud, and medium-damp soil. The spikes are a bit much for mud,

and are apt to throw big chunks of it all over the place, resulting in speed and power loss. For the intended use of the car, the tires are well-suited.

Power from the drive battery is regulated by a 3-speed resistor-plate controller. It also features reverse speeds. A standard two-point wiper gets the power separated. When the power hits the controller, the juice will find



Bare bones of the Shuttle reveal the steel chassis and fiberglass upper plate. Note also chain-drive linking two gear boxes, fore and aft of the chassis.

its way to the motor; in our case, the powerful Magnum 360 motor from AYK. This motor will give plenty of motivation when needed.

With assembly nearly complete, final touches include a hefty roll bar that is strong enough to stand on, and which arches right over the top of the Shuttle. At the front, there's an oversize plastic bumper, which is backed up with a smaller nose bumper. You were in bigger trouble than you thought if something penetrates both these bumpers!

The body is a polycarbonate-type shell, and requires painting. I used Parma* paints to tint the body white, and did the trim with the included decals. A wing also is provided, although you probably won't get to use it much, after you find out what the Shuttle will do. The body is held in place with a single clip at the front and two-nylon cable ties at the roll bar. I'd prefer a less-permanent method of retaining the body than cable ties, but that's just personal bias.

Once the body is done, it's time to test the radio setup and then head for the boonies to see what this car's got.

PERFORMANCE. Punching the throttle, I found the Shuttle had fairly good speed. The tires dug in very well, allowing good traction with little wasted tire-spin. The suspension worked well, socking up the big ones and eliminating the little ones. The car remained in good control at all times.

Cornering was nice, with little body roll and stable ride. It was nice being able

(Continued on page 96)

Track Report



To commemorate Tamiya's 10th year in R/C cars, they've unleashed this new four-wheel-drive beast.

MRC/Tamiya



BIG WIG

WITH ALL THE RC CARS available, it takes a very special car to stand out from the crowd. Nevertheless, the MRC Tamiya* Big Wig is just that. This car was produced in

commemoration of Tamiya's 10th year in radio-controlled car development, and in cooperation with Japan's foremost race car designer, Takuya Yura, who created the Big Wig's stylish aerodynamic body.

THE KIT. The Big Wig is a high-performance shaft-driven four-wheel-drive 1/10-scale electric racing machine. It features front and rear differentials, double-wishbone four-wheel-independent suspension dampened by four large-capacity adjustable coil-over oil-filled shocks, rack-and-pinion steering, and the new RX 540vz Technigold motor. This all comes nicely packaged in an attractive box with full-color illustrations of the car and its components. Inside you'll find that all the parts are either blister-packed or in bags, making it very easy to find any part needed.

You'll need to purchase a few things to complete this kit. First, you'll need a two-channel radio. For my own purposes, I chose Altech

Marketing's* Acoms Technisport Aw75r, a high-quality pistol-grip wheel radio with all the desired features such as servo-reversing, variable-rate servo throw, and a reversible handle to accommodate left-handed drivers.

The Big Wig was designed so that all the electronics in the car will run off of the battery pack normally used for propulsion. This is accomplished by using a battery eliminator circuit (BEC), which is available with connectors to fit most major brand radios. For the battery pack, either of Tamiya's 7.2 packs can be used—but if you really want to rip up the ground, the new 8.4 gold power pack fits right in with the connector supplied with the kit.

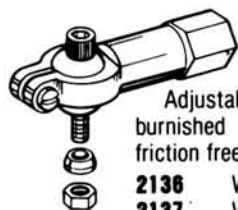
You'll also need a charger, and paint for the polycarbonate body.

ASSEMBLY. Before starting, take a few minutes to thumb through the manual to familiarize yourself with the parts and procedures. The

(Continued on page 96)

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2116	2.5	MM X 6	4/pkg		2125	3	MM X 18	4/pkg	
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RACING, RACE STRATEGY and PRACTICING TO WIN

by DICK BRINTON

Clockwise from top: Acclimate yourself to the drivers' stand during practice; make a mental note of hazardous areas on the course so you can avoid them; breaking-in your electric motor will add a noticeable difference in both performance and longevity; avoid ripples often found on the inside of a turn.

WHETHER you're brand new to the sport of off-road R/C car racing or whether you've got some experience, this series of articles can help you become more competitive. Even if you don't race, you'll find much to interest anyone who enjoys our sport/hobby.

Here are some answers to why things happen and some tips on "how to," and I'll also talk about strategy to help give you an edge on your competition.



heats up, just disconnect it for a bit until it cools down.

If you're new to the sport, you may prefer to break the car in by driving it so you can get acquainted with the problems of driving an R/C car before you head for the local track. If you decide to do it this way, pick a level, open area such as an empty parking lot. Put up some milk cartons for markers and drive a definite course, *slowly*. Avoid full throttle. Get used to seeing how the car looks coming and going and at all angles between. Learn to judge the



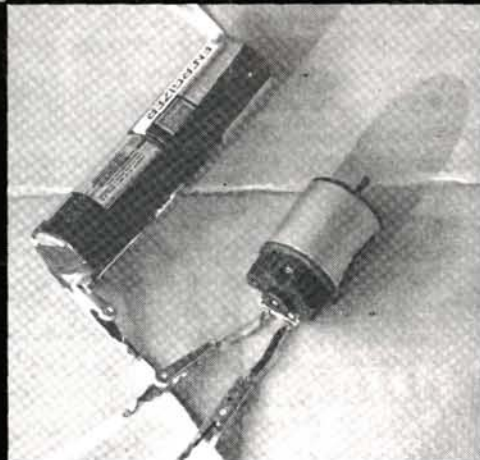
commutator. Since the brushes provide the path for the power to flow into the armature, until the brushes wear to the roundness of the commutator, the transfer of power will not be efficient. A lot of arcing will result, which builds up heat quickly, and this can ruin a new motor. In addition, a well-broken-in motor produces more power.

The easiest way to break in a new motor is to hook it up to two new D cells in series and let it run for two or three hours while checking it occasionally to make sure it isn't getting too hot. If it



In order to be competitive, you must start at the beginning. The first requirement is to have a well-set-up, well-broken-in car. (See "Handling, What It Is and How To Get It" in the Summer 1986 edition of *Radio Control Car Action*.)

If it's not set up correctly, your car won't handle as it should; and if you ignore the break-in, you'll not realize the full potential of your racer. For example, it's too expensive for manufacturers of most motors to machine the brush faces to the exact curvature of the



distance between your car and the markers so that you can come close without clipping them.

I suggest you put a minimum of one hour's running time on your car, slowly. If possible, don't use reverse at this time. Give the motor brushes and gears a chance to wear together in a forward direction and you'll have a faster, longer-running car. As a matter of fact, I don't have reverse available on any of my cars. I set up the speed controller for braking only, since ORCCA rules prohibit reverse during races.

After you complete the break-in, it's time to head for the local track, but before you go, charge your battery and check over your car. It's much better to get these things done at home because you'll probably be somewhat nervous at the track the very first time. It's happened to all of us.

I've experimented with various procedures to charge my batteries and found a way that works best for me and produces the longest battery life. I trickle-charge overnight, or charge at 1 amp for 1 1/4 hours if I start with a flat

driver's stand, as that's where you'll be on race day. Some people are shy about climbing up there when others seem to be driving from ground level. Ignore them. You'll be beating them soon.

Drive your car *slowly* around the track. At this point don't worry about the other traffic. Just try to negotiate the track without running off or into a catch fence. Your purpose is to get used to seeing your car on the track when viewed from the driver's stand.

As you get more familiar with the track and with the way your car

horn, yells "go"...everyone accelerates off the line...and two cars tangle up. Collect three more cars, and suddenly only two cars are heading into the first turn.

This brings us to rule number one: a good start is necessary in order to do well in a short 4-minute race where the cars and drivers are evenly matched. The purpose of a good start is to put you first into the first turn. This avoids the tangle that develops on most starts since they occur after you've gone. Many times your prime competition will get

battery. I *never* let my batteries get hot. They are seldom even warm; and since I started using this system, I never failed to complete a race because of power loss.

I mark my packs "Heat 1," "Heat 2," and "Main" (if that's the way we're running), charge them the day before, and then just trickle them before the various races.

If your charger is the fixed-current type, check your battery constantly and don't let it get hot. When you feel it starting to warm up, stop charging

handles, start speeding up—but not all the way around the track. Pick a section that seems easy to get around and start picking up the pace at which you drive that section. On the rest of the track, continue to drive well within your limits. After you learn one section and can drive it well, pick another section and concentrate on learning it. As you learn sections, start stringing them together. As you can see, you're learning the track piecemeal and while practicing you're becoming more familiar with your car—and in the process, getting faster.

tangled up on the start, and if you get a good start, you've got a big edge for the race. When you're first, you have a clear track, and only your own errors affect you. The guy behind must go faster to catch you, and he's more likely to make a mistake. If you get a bad start, you must go faster to catch up and then you must pass your competition to win the race. This is a lot tougher.

To give yourself the edge, consider the following tips:

Before the start.

1. Prepare your car correctly.

because it's a lot hotter inside! A hot battery is dangerous and will not supply the same power as it will when cold.

When you arrive at the track, take a few minutes to familiarize yourself with their system. Do they have a transmitter impound? What is their method of frequency control? These two items relate to whatever method (if any) is used to keep two people from trying to operate two cars on the same frequency at the same time.

If there is no frequency control, ask around to find out who might be oper-

After a few recharges you'll be able to go around most of the track reasonably fast, but there will still be sections, or perhaps turns, that give you fits. The answer is correct practice.

I've watched drivers crash on a particular turn time after time and never change their way of driving that turn. They are, in fact, practicing mistakes! It's tough to get better when you're actually teaching yourself a mistake over and over.

When you have trouble with a turn or piece of track, try changing the way you

2. Run good tires with lots of sharp tread. Make sure they are correct for the track surface.

3. Practice starting so that you can get off the line quickly.

4. Set up your steering trim and differential (where possible) so your car tracks straight off the line under full power.

5. Watch the starter start races before yours and get an idea of his cadence so you can anticipate the start. Start early or on time, but *never late*.

6. Check the starting line surface

ating on your frequency. Whatever you do, don't just turn on without checking. You won't be very popular. Walk around the perimeter of the track and take a good look at it. What seems to be the hardest part? If you can't judge yet, see where others may be having problems.

Ascertain in which direction the traffic is moving. When your frequency is clear, you're ready to drive. Place your car at the edge of the track and climb up onto the driver's stand, if there is one. Get in the habit of driving from the

drive it. Find out what the car wants to do and use its strong points to get around quickly. If you can't figure it out for yourself, watch someone who is going fast and see if what they are doing will work for you. I'll have more to say about this a little further on.

Ultimately the only way you can judge how well you're doing is by running against someone else in your class. So let's take a look at a typical race starting at the start.

The cars are lined up side by side and the starter drops the flag, blows the

and see where the best traction is.

7. Take a look at the track surface from the starting line through the first turn. Are there any areas you should avoid—ripples on the inside of the turn, for instance, or a bump in the center of the track? Make a mental note of where you want your car to be when it enters the first turn. Get up on the driver's stand and picture the start and your line (this is the course your car will take) through the first turn. Get it solidly fixed in your mind.

(Continued on page 112)

Kyosho

by RICH URAVITCH

Chevy 4x4 Pick-Up



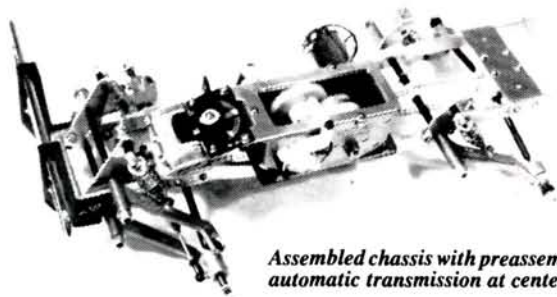
HEAVY CHEVY

With four-wheel drive and two-speed transmission, you can boogie in the dirt!

ON A WEEKEND not long ago, my wife, Maribet, sister-in-law Carol Nail, her friend Carol Smith, and yours truly were sitting around the table talking of all things, R/C cars. This followed an afternoon of bashing about with my fleet of four cars, which you regular readers have seen on these pages in previous issue. The ladies now wanted *their own* cars, an idea I wholly supported—if anyone was going to trash my road rockets, it was going to be me! To aid in the selection process, I dragged out some back issues of *Radio Control Car Action*.

Thumbing through the mags, my sister-in-law looked over at me and asked “How about a truck?”

“A truck?.... Are you serious?”



Assembled chassis with preassembled automatic transmission at center.

"Yeah," she said.

We finally decided on the Kyosho 4x4 Pick-up distributed by Great Planes Model Distributing Company*.

THE KIT. When we finally got it home we were surprised! The kit doesn't require assembly; most of it, especially the automatic transmission, is already done for you. The plastic body is pre-painted in a deep dark red and requires only the addition of a complete set of stick-on trim markings plus molded-plastic accessories like mirrors, roll bar, and driving lamps to be ready for attachment to the chassis.

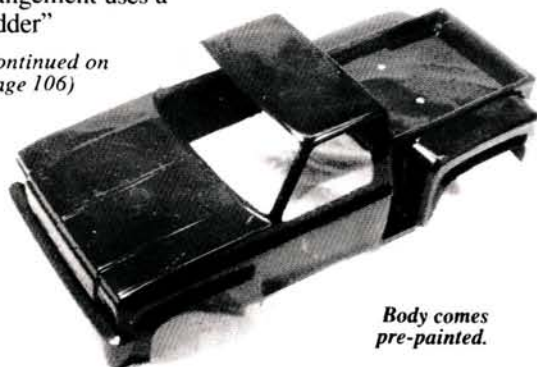
ASSEMBLY. A 12-page assembly manual walks you through the building in an organized manner. You'll need some basic tools like screwdrivers, pliers, and an X-Acto knife, plus general equipment for assembly along with some grease and oil for lubrication. A small bottle of the CA Super Glue also will be required. I use Zap from Pacer Technologies*

because it's readily available from my local hobby shop as is a material called Slip-It, also from Pacer. It's a magical linkage-and-bearing lube. Amazing. It makes any surface super-slippery.

As with any of these kits, it's always better to have your radio available at the same time. This is especially true of this kit as the major portion of the assembly process is the radio installation. We used an Aristo* Challenger II two-channel trigger/wheel type radio in the Chevy and the installation went rather easily by following the appropriate instructions. Linkage adjustment for the throttle/gearbox was a bit tedious and took a while to get right, but then it stays pretty much dialed in. The illustration depicting this step, on page 6 of the instructions, is *in error* as the "neutral" and "backward" illustrations should be reversed. This will become obvious once you actually go to adjust the linkage on your Chevy.

The four-wheel-drive arrangement uses a "ladder"

(Continued on page 106)



Body comes pre-painted.

Track Report

from Great Planes Model Distributors

Kyosho

Plazma!



by MIKE LEE

Loaded with high performance features.

ACCORDING to Webster's Dictionary, plasma is "...a collection of charged particles being a good conductor of electricity and in being affected by a magnetic field." When you think about it, that makes a pretty good description for an electric R/C road racer. Appropriately, this review deals with such a description and race car from Great Planes Model Distributors*, the Kyosho Plazma Mk II.

THE KIT. The Plazma Mk II is a pretty serious little asphalt burner with features found on many other cars, but not on one single car. It is a 1/12-scale, two-channel road racer that features a fiberglass chassis pan and upper shaker plate, cast aluminum rear braces and motor mount, mono-shock rear suspension, single-tube front axle, and a gear differential. It is a compact chassis, requiring the use of mini- or micro-servos to operate.

ASSEMBLY. Assembly of the Plazma Mk II is pretty easy and I started off with the front end. Mounting the single-tube axle requires only a few setscrews into the chassis to the axle blocks. I find that

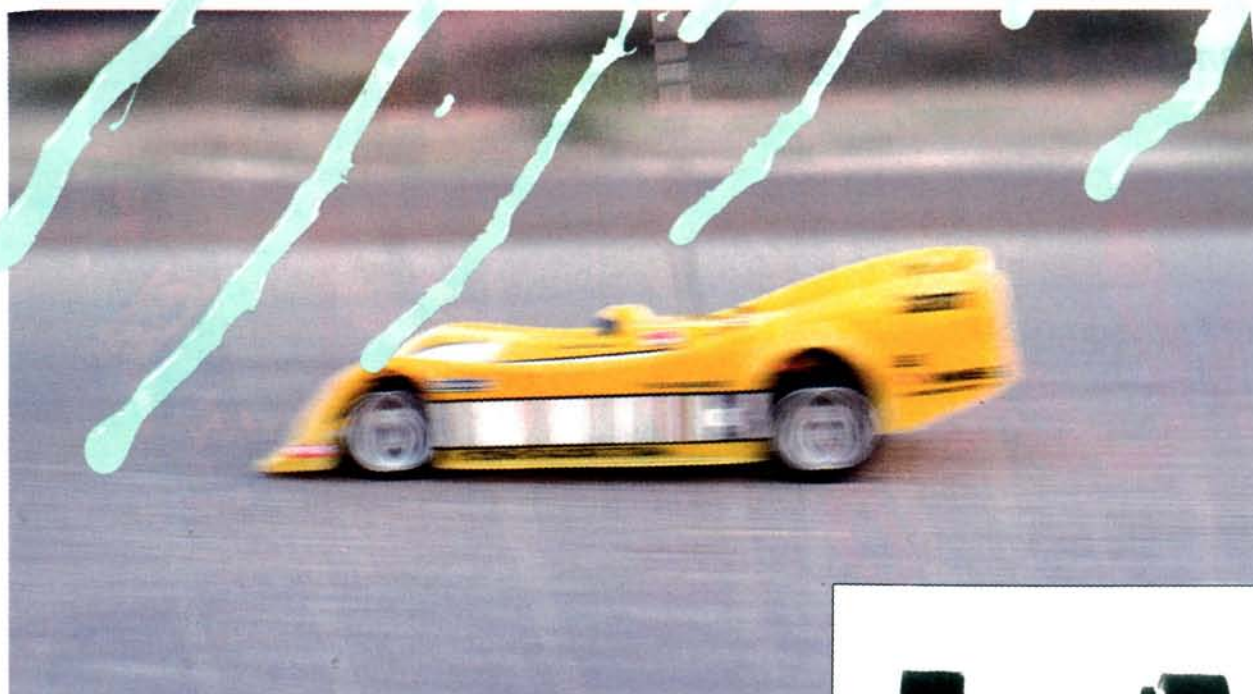
the wheel castor is adjustable with a single setscrew in the right axle block. Once loosened, the castor can be set as desired. I prefer a slightly negative castor over the recommended neutral setting.

The front end is finished by mounting the spindle blocks, tie-rods, and then the wheels and tires. I had no problem at all with this type of front end.

Moving to the rear, I found the rear end braces and motor mount pre-assembled as a single unit. The nicely done instructions show how to disassemble this group should the need arise. Mounting to the chassis takes a mere moment or two, and you move forward to the rear axle.

The Plazma is normally equipped with bronze Oilite-type bearings, however ball-type bearings are available and I choose to use them for speed and long life.

The rear axle is a hardened steel unit that should withstand the toughest abuse. Mounted to it is a Kyosho gear-type differential, which is adjustable in tension. It will not purposely slip, but it will lock up if desired. Just outside of this are the plastic rims and medium compound tires.



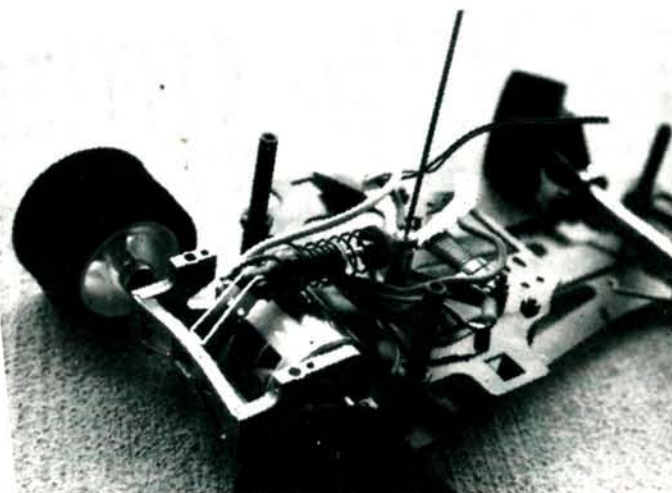
The motor supplied with the Plazma is the LeMans 600E, a Stock Class plain bearing motor with modular end bell. Performance from the 600E is outstanding for a Stock Class motor and I recommend it. Believe me, the novice driver will have his hands full!

The motor is mounted in a conventional side-mount configuration with right-side drive. Just above the motor is an oil-filled shock dampener with spring assist, which serves to provide the main suspension action for the car. Just ahead of the motor mount is the main flex point of the chassis. Left uncontrolled, this would cause the car to bounce when it encounters bumps. The dampener effectively stops the bounce action and smoothes out the handling. The spring assist will return the dampener to its normal position quickly, ready for the next road hazard.

Next is the upper shaker plate. As is the main chassis, the upper shaker plate is black fiberglass, and it will hold the speed resistor and throttle servo, plus hold down the battery. The four-point mount of the shaker plate controls



Underside of Plazma shows a clean chassis which prevents hanging up with any foreign debris on the ground.



Rear-end closeup shows mono-shock suspension. The single coil-over oil-filled dampener with spring assist is fully functional.

unwanted flexing of the main chassis and will allow slight retweaking if necessary. The speed controller is a multi-band wire-wound ceramic resistor in a miniature size. Because it's very compact, it requires a short throw from the servo, yet displays good linear response. Heat tolerance is very good. A standard copper wiper with copper contact button is used to throttle the resistor. A one-step brake circuit is provided via a fixed resistor attached to the neutral end of the main resistor. There is no reverse speed.

That about nails it for assembly except for the radio installation. I used a Futaba* Magnum Junior for guidance. This radio was furnished with the micro-size receiver, type R2H, and S-32 mini-servos. Fit to the Plazma was right according

to the plans with no problems. The Plasma kit provides a servo-saver designed to fit all major radio servos.

For those not familiar with the Magnum Jr., this is one popular radio set. It features two-channel operation with throw rate adjustment on steering, end point and center adjust on throttle, variable steering tension, multi-position trigger, and servo-reversing. With this many features, it's not hard to understand why this radio is so popular. Performance with the Magnum Jr. was superb.

The body for the Plasma Mk II is the Kyosho CRC Mk II, although the normally supplied body might also be the Alfa Romeo CanAm. These are both polycarbonate plastic bodies and I painted them with Parma* paints, sprayed on with an airbrush. Trim and decals are supplied in the kit, and really dress up the car. With the car done and radio checkout complete, I headed for the track.

PERFORMANCE. My initial impression of the Plasma Mk II was one of weight—it's very light! Even though its hardware appears heavy, the Plasma still feels like a bantam-weight. Once I pulled the trigger of the Magnum radio, I found this illusion of weight was no fluke. The car was off like a shot!

As I mentioned earlier, the Plasma comes with medium traction compound tires, and they yielded very good bite. The Plasma handles well with these tires, the differential obviously doing its job correctly through the turns. I prefer a ball-type diff, but the Plasma showed that life without the ball diff is not bad at all.

Suspension work from the chassis proved very nice, with the bumps taken well with no leaping from the pavement. Once nice little item in the kit is a roll-over antenna, mounted mid-ships on the car. This proved worth its weight in gold, and I admit to using the darn thing more

than once! Corner dots are terribly unforgiving at times.

Overall, the Plasma Mk II is a fun car to drive. It handles well, goes together quickly and easily, and is competitive. Its low price is certainly welcome, especially when racing money is at a premium. For something defined as a good conductor of electricity and affected by a magnetic field, the Plasma Mk II electric R/C road racer fits the bill well. Try one out and let it affect you.

**The following are the addresses of the companies mentioned in this article:*

Great Planes Model Distributors Co., P.O. Box 4021, Champaign, IL 61820.

Futaba Corporation of America, 555 W. Victoria St., Compton, CA 90220.

Parma International, Inc., 13927C Progress Parkway, N. Royalton, OH 44133. ■

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The Next R/C Dimension

by RANDY RANDOLPH

Once You've Mastered R/C Cars, Why Not Try R/C Airplanes... *It's Easy!*

Clockwise from left: Airplane elevator controls third dimension—up and down; aircraft transmitter—right stick moves forward and back, left and right; brothers under the skin—PT-20 and Grasshopper, both learning machines; turning left, plane steers from back, note rudder deflection.



FLYING R/C airplanes is a lot like going over a jump with a car—you just don't land so quickly! Airplanes and autos are really brothers under the skin, except that airplanes operate in one additional dimension, the vertical. This extra dimension adds much more than just a 33% increase in control experience, it makes the sky the limit.

Flying is easy for any driver to learn. I've never had a student with R/C car experience who didn't learn to fly in a much shorter time than someone without the experience. That includes pilots with thousands of hours flying time in everything from transports to crop dusters. For one thing, drivers have the ability to "put themselves in the car," which means when driving they don't have to think which way is left and which way is right. They just drive it where they want it to go! That ability is the most difficult part of learning to fly. So, since you already know how to go left and right, the only thing you have to learn is how to go up and down.

The airplane has an elevator control and a throttle that cause it to fly faster or slower and go higher or lower, but maybe not the way you always thought!

On the aircraft transmitter the right stick now goes forward and back as well as side to side. When the stick goes forward, the elevator goes down, the nose of the airplane goes down, and the airplane flies faster. When the stick comes back, the elevator goes up, the nose goes

up, and the airplane slows down. All this time you thought that the elevator caused the airplane to go up and down. Well it does, but more importantly it controls the speed of the airplane. It's the throttle that makes the airplane go up and down, for it takes more power to climb

and less to descend while maintaining the same speed.

That stuff about what makes the airplane fly faster or slower is rather important because an airplane must maintain a certain speed to stay in the air and be controllable. The only time you let an airplane slow down is just before it lands!

There are three things you need to become a flier: an airplane, an instructor, and a radio on one of the aircraft frequencies. (It's against federal law to use car frequencies to fly airplanes, and the same goes for using airplane frequencies to run cars!) Instructors can be found at almost

(Continued on page 106)

HOPPING UP THE ASSOCIATED



RC 500

by RICH HEMSTREET

SIX YEARS ago, Associated Electrics* introduced the RC500, and this 1/8-scale racer has been winning major races ever since. I expected to find a large number of hop-up parts available for this car, but I was surprised. It isn't that the RC500 is the same car it was in 1981, but Associated has now made almost all of the hop-up parts part of the standard kit, and the parts are available for updating older RC500s.

With the new standard kit, the '87 RC500 is very fast and very competitive right out of the box.

What do you need to bring your four- or five-year-old car up to current state-of-the-art design? First, the front shocks have been replaced. The new coil-over shocks are smooth, and there is a screw adjustment for tension on the springs.

The only other change to the front end is the new front anti-roll bar. This bar is mounted above the upper A arms, but the ends connect to the lower A arms. Associated says this is the setup that their drivers use, and it's said to be far more effective than the old lower anti-roll bar.

There have been a lot of changes at the rear of the RC500. The fiberglass disc brakes have been replaced with very effective dual-steel disc-brake rotors. The brake pads are made of composite; I believe that asbestos might be used.

The chain drive has been replaced with a new belt-drive kit, and this saves weight and is more efficient.

Another update is the new rear shock mount, which moves the shocks outboard. The cantilever effect of the old system is replaced with the moving end of the shock now connected to the lower A arms. This new system is so effective that the RC500 no longer needs a rear anti-roll bar.

The new rear shocks look very familiar, as they were first used on Associated's RC10. These shocks are very easy to build and really hook up the rear end to the track.

A quick-change rear wheel hub system is now standard for all RC500s. It takes only seconds to change both rear tires in the middle of a race. Hopefully, Associated is working on a front quick-change system, which would just about make the car complete.

As far as options go, there are a few that I've used. I installed a large Kimbrough* servo saver on the Futaba* S-28 steering servo. This provides more direct control of steering. The Futaba Magnum Junior controller permits remote adjustment of the steering rate.

I installed an O.S. Max .21 VF-R ABC engine from Great Planes Model



Above: The new rear shock mount moved the shocks outboard. Below: The new rear shocks were originally developed for the trophy-winning RC10.



Distributors*. This engine includes the 2S slide carburetor. It also provides good solid power when coupled with an O'Donnell muffler from Associated.

The sharp-looking aluminum wheels are from Advance Engineering*. These wheels are a little heavier than the standard plastic rims, but if you're entering concours competition, you have to get some. The wheels are very sturdy. The tires are low-profile MRC Grand Prix's from England—not to be confused with MRC in this country. These are also distributed by Advance. It's been reported that these tires have set several track records in Europe. They come in several compounds and in both standard profile and low-profile.

The primary option that Associated still sells as an extra is their two-speed transmission, which gives the RC500 better acceleration off the turns and then shifts to a higher gear ratio on the straights. The instructions point out that it's critical to put this transmission together properly for peak performance. The two-speed is not necessarily suited to all tracks. On some tracks, with very few straights of any length, it might not provide any advantage at all, but when you're ready for the ultimate RC500 two-wheel-drive, the two-speed is available.

Associated has done a great job of keeping a six-year-old car design competitive. They've shown a commitment to keeping the cost of racing down by updating rather than replacing. As new parts are developed and tested, they become available to the public. Everybody has a chance to use what the Associated team drivers race in major events.

**The following are the addresses of the companies mentioned in this article:*

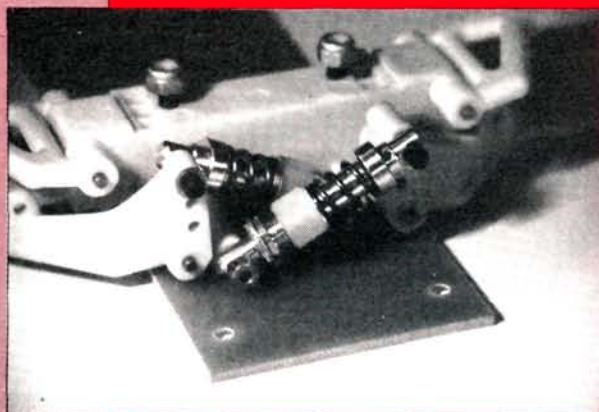
Associated Electrics, 1928 E. Edinger, Santa Ana, CA 92705.

Kimbrough Products, 1430 East St. Andrews Place Unit E, Santa Ana, CA 92705.

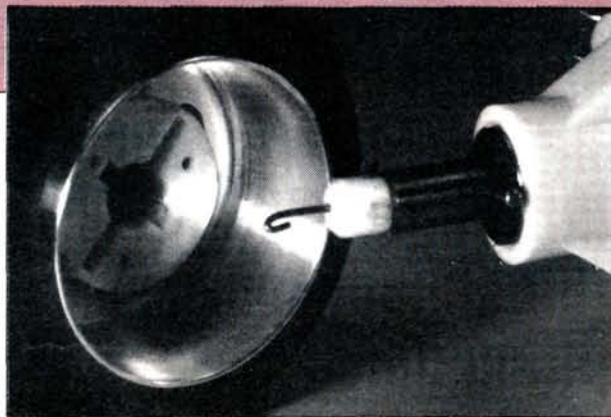
Futaba Corporation of America, 555 W. Victoria ST., Compton, CA 90220.



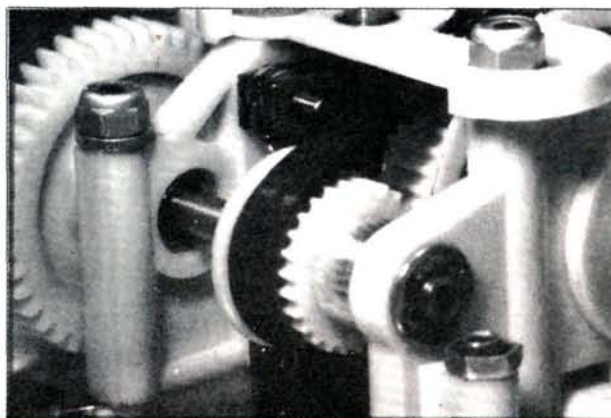
The new belt drive system that replaced the old chain drive.



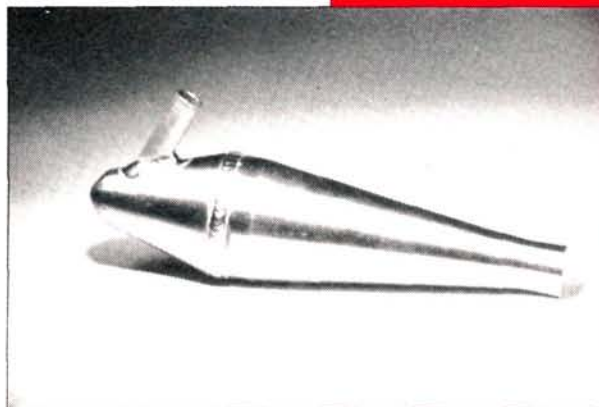
New front shocks provide screw adjustment to the springs. After the springs are adjusted, the shocks are covered with a rubber boot.



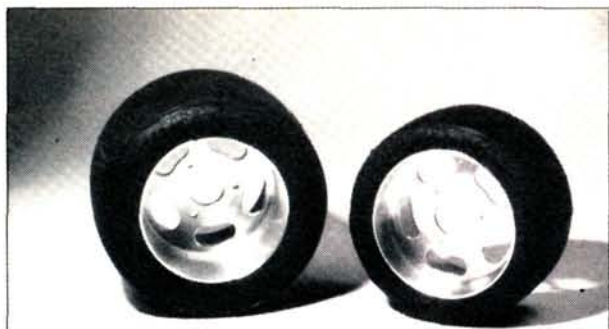
Left: The quick-change rear hub system is really trick.



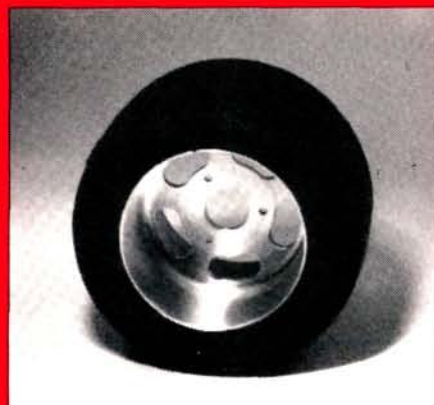
Left: Directly behind the belt you can see the new brake pads.



The O'Donnell muffler is available through Associated.



Left and right: The precision-machined aluminum wheels and Gran Prix tires are available from Advance Engineering. Below right: O.S. Max .21 VF-R ABC engine from Great Planes Model Distributors.

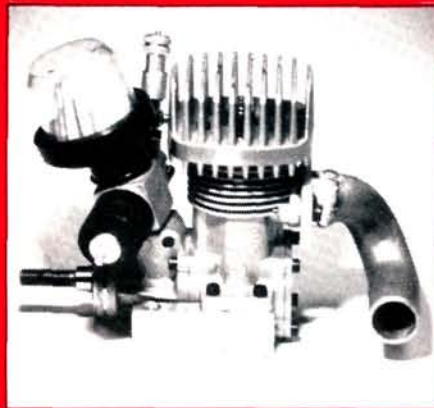


Right: Kimbrough Servo Saver mounted on Futaba S-28 servo.



Great Planes Model Distributors,
P.O. Box 4021, Champaign, IL
61820.

Advance Engineering & Mfg., Co.,
P.O. Box 766, Woodland Park, CO
80866.



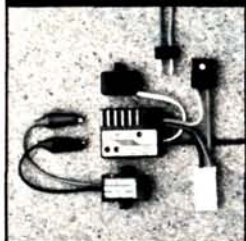
KO PROPO
KO THE COMPETITION

PULSE QUICKENING

KO PROPO
KO THE COMPETITION

POWER

CX-II MOS/FET SPEED CONTROL

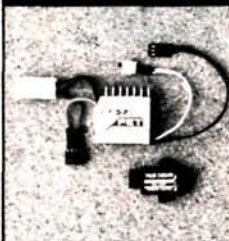


For 1:12 and 1:10 scale racing, forward only with FET braking. Pulse checker included. (Optional heat sink available.)

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Voltage:	6—9.6v
Capacity:	75A (continuous) 220A (surge)
Loss resistance:	0.015 ohm
Dimensions:	1½" x 1¼" x 11/16"
Weight:	0.97 oz. (w/o switch or connectors)
Mini connector:	KO or Futaba
KO connector:	NO. 424080
Futaba connector:	NO. 424081

RM-7 MOS/FET PRO SPEED CONTROL

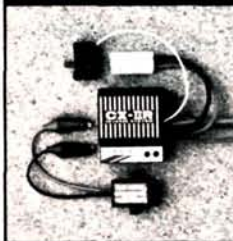


High performance for the 1:12 or 1:10 scale expert. Finest MOS/FET technology for superior response, reliability and least power loss. Forward only with FET braking, pulse checker included.

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Voltage:	6—9.6v
Capacity:	150A (continuous) 450A (surge)
Loss resistance:	0.008 ohm
Dimensions:	1 7/16" x 1 3/16" x 9/16"
Weight:	1 oz. (29g)
Mini connector:	KO or Futaba
KO connector:	NO. 424085
Futaba connector:	NO. 424086

CX-III MOS/FET SPEED CONTROL W/REVERSE



For 1:12 and 1:10 offroad and road racing cars. built-in reverse and heat sink. Pulse checker included.

\$119.99 retail
\$89.99

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Mini connector:	KO or Futaba
KO connector:	NO. 424083
Futaba connector:	NO. 424084

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Track Report

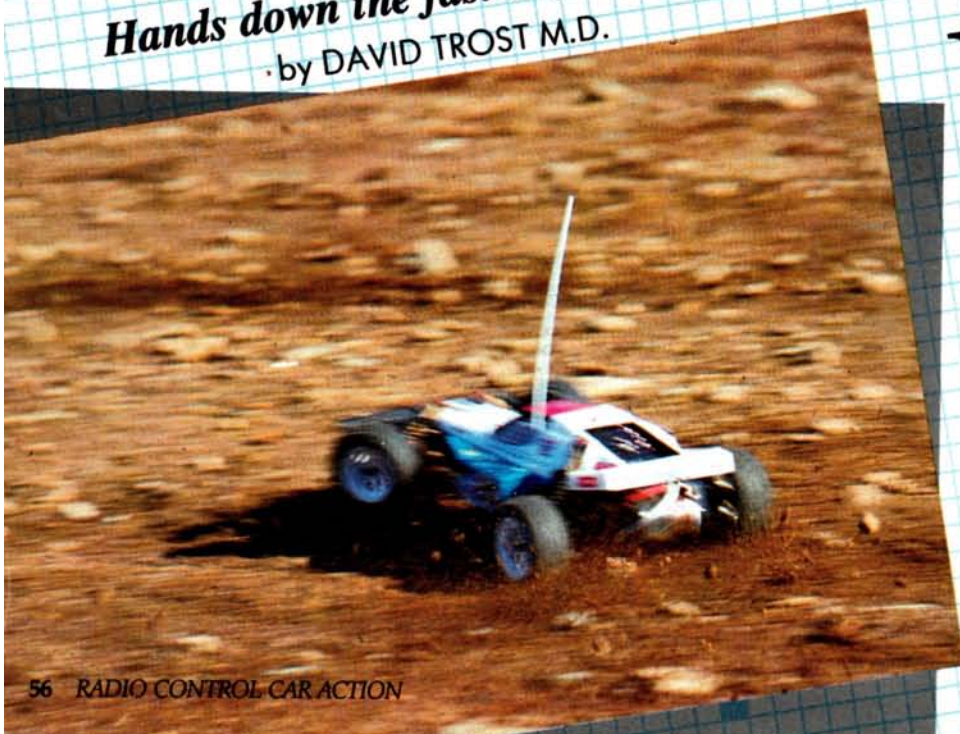
From Great Planes



Turbo O.P.T.I.M.A

Hands down the fastest four-wheel-drive car out of the box!

by DAVID TROST M.D.



IT WAS ONLY a year ago that Kyosho, distributed by Great Planes Model Distributors*, introduced the Optima, a four-wheel-drive buggy that's taken the winner's circle by storm. Now, 100,000 Optimas later, the people at Kyosho have decided to improve on their already outstanding machine. They've gathered up many of the best Optima hop-up modifications seen on the race course and are offering them all in one package. The Turbo Optima is the culmination of their efforts to build the best off-road car kit on the market.

Outwardly the Turbo Optima chassis resembles the standard Optima/Javelin chassis, but there are subtle differences. The Turbo Optima has a superior suspension system with heavier wishbones, front and rear stabilizer bars, and top-of-the-line adjustable shocks. The Turbo Optima comes complete with a full

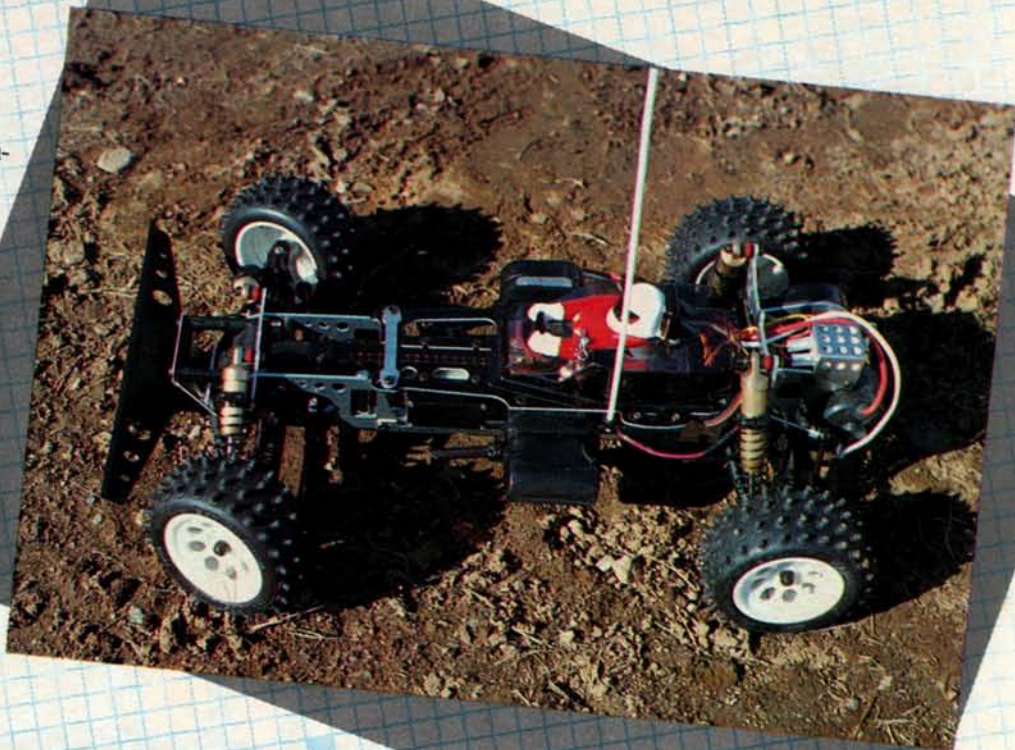
set of 16 ball bearings and a high-rpm LeMans 240S motor. The drive system features a heavy-duty drive chain and a torque limiter to protect the drive system during lightning-quick starts. For added speed and excitement, the Turbo Optima was designed to run from an 8.4-volt pack instead of a 7.2-volt pack. The car comes with a voltage regulator to drop the motor battery voltage down to the 6 volts the radio needs.

THE KIT. The Turbo Optima comes attractively packaged in a large box. The parts are well packed to prevent damage during shipping. The 28-page assembly manual is very complete and contains all the information needed to build the car and much more. It gives a good description of motor care, battery charging, and chassis tuning for maximum performance. The radio installation section of the manual contains specific installation instructions for the most commonly used servos.

CONSTRUCTION. Assembly of the Turbo Optima is organized into 53 steps, each very nicely illustrated and explained in the manual. Since the manual is so good, there's no need to comment about specific building steps.

The Turbo Optima's main chassis consists of eight aluminum pieces. These parts bolt together to form cages in the front and rear which enclose the gear boxes and are connected by two aluminum bars. The gear boxes are molded of fiber-filled nylon and house the differential in the front, and the differential and some of the drive gears in the rear. The differential housings are also made of fiber-filled nylon and contain metal gears. Each differential is supported by two ball bearings. Power is transmitted to the front end by a fully enclosed chain-drive system. Two different differential gear ratios are provided so you can vary the relative speeds of the front and rear wheels. On my car the front and rear wheels rotate at the same rate.

The front and rear suspension systems are constructed largely of fiber-filled nylon for strength and lightness. Both consist of extra-long double wishbones for handling uneven terrain with minimal effects on steering. Damping is provided by coil-over oil-filled shocks on all four wheels. Both the front and rear suspensions have adjustable camber and ground clearance. Each of the front and rear axles is supported by two ball bearings. The "option house" shocks provided can be tuned to any track condition. The front and rear stabilizer bars are also fully adjustable. The



tires are a low-profile spiked design.

The receiver and throttle servo are mounted on a fiberglass plate which also serves to stiffen the main chassis and hold the motor battery. Parts are provided to mount just about any standard or mini servo. The resistor type speed controller provides three forward and two reverse speeds.

I used a Kyosho Pulsar two-channel radio in the model. This system features a pistol grip, wheel transmitter with servo-reversing. It has semi-adjustable throttle trigger centering to allow it to be used for gas or electric cars. The steering wheel has adjustable centering tension. The receiver is lightweight and small enough to fit in any 1/12-scale racer. The servos have plenty of power and are relatively fast. Both transmitter and receiver have changeable frequency crystals.

The battery was the Kyosho 7-cell 1,200-mAh Turbo Racing battery. The kit comes with a hot LeMans 240S motor. Kyosho LeMans motors are modified, high-performance motors, and there are many available. LeMans model numbers are based on the motor's expected run time (in seconds) using a 6-cell, 1,200-mAh battery pack. Most of the LeMans series motors have adjustable timing, diamond-trued commutators, and coils potted in epoxy resin. Many have dual ball bearings.

The clear polycarbonate body was trimmed and painted with Tamiya's paint specially formulated for polycarbonate bodies. The body was completed with the fine set of pressure-sensitive decals provided.

A Kyosho Auto Charger was used to get the most out of the battery. This charger operates off of a 12-volt car battery and will charge

(Continued on page 114)

Track Report

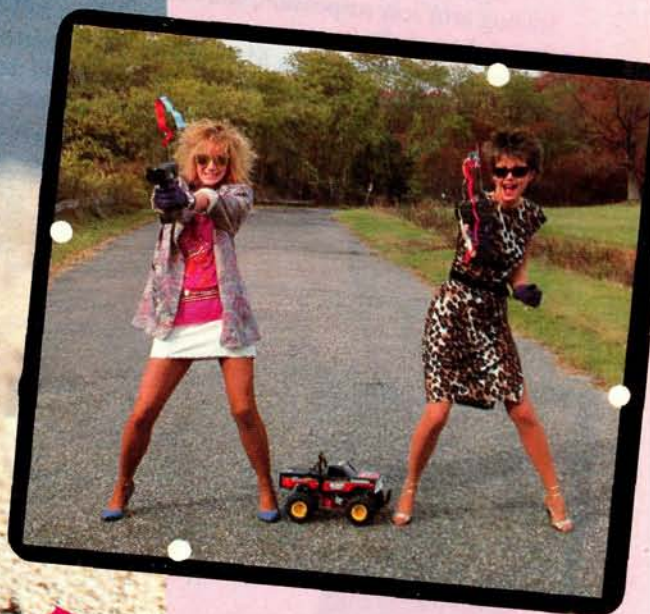
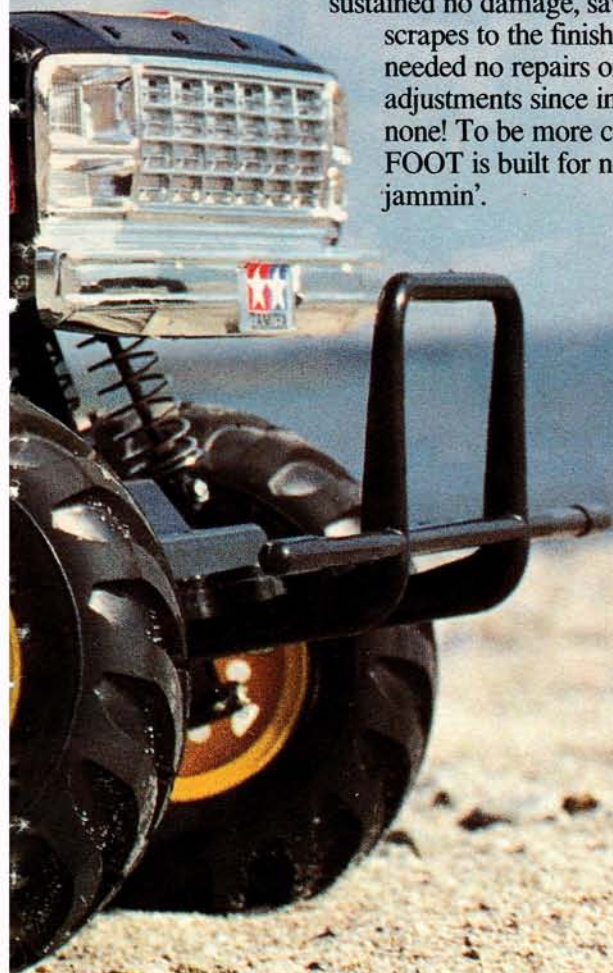


The BLACKFOOT

by CHRIS CHIANELLI

AS YOU CAN see from the photos, there are a number of beauties pictured here that were all born to rock and roll! But the rock and roll machine we're going to focus on for the time being is the MRC/Tamiya* Blackfoot. So, monster maniacs, listen up! I'm sure we all agree that R/C "terra-terrorizing," in *all* its forms, is great. Nevertheless, to some of us mud-stompers, nothing beats doin' the monster mash with a favorite truck, and when it comes to great looks and low maintenance durability, the "FOOT" steps out with the best of them.

The Tamiya Blackfoot Ford F-150 Ranger, although a completely new offering in the monster truck category, incorporates many of the time-proven features found on other Tamiya cars to make the Blackfoot one of the most trouble-free, rugged R/C cars I've ever tested. After many jumps, head-on crashes into curbs, high-speed end-over-end flips and flat-out disagreements with boulders, the Blackfoot has sustained no damage, save minor scrapes to the finish, and has needed no repairs or even adjustments since initial assembly, none! To be more concise, the FOOT is built for non-stop jammin'.



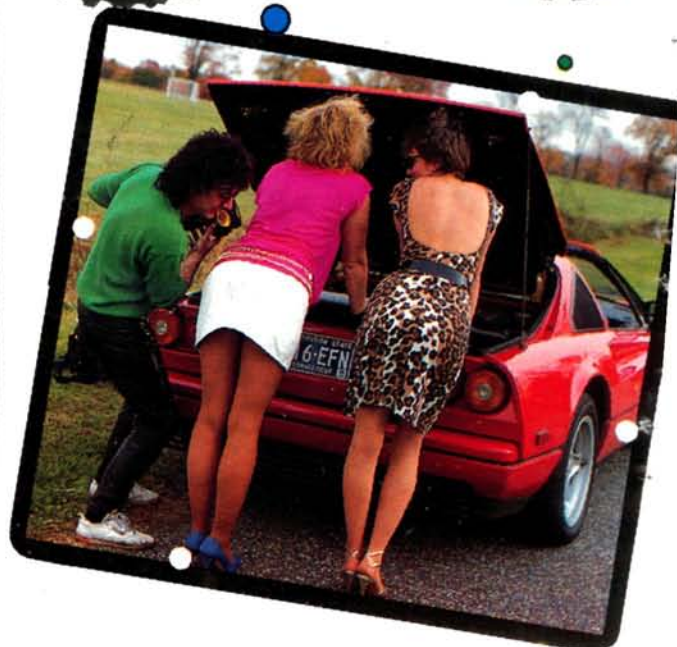
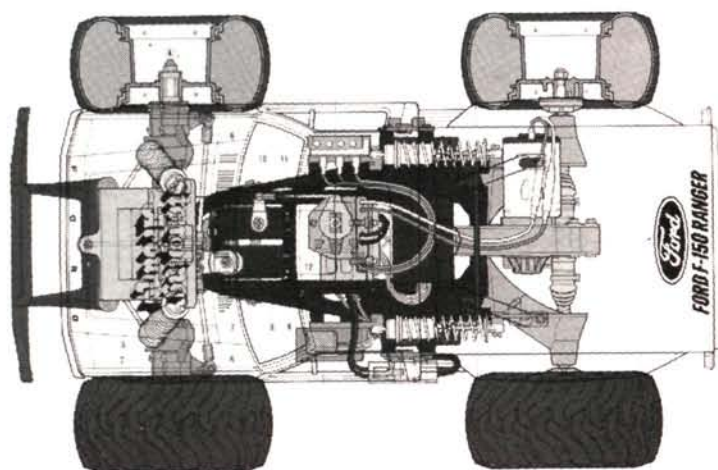
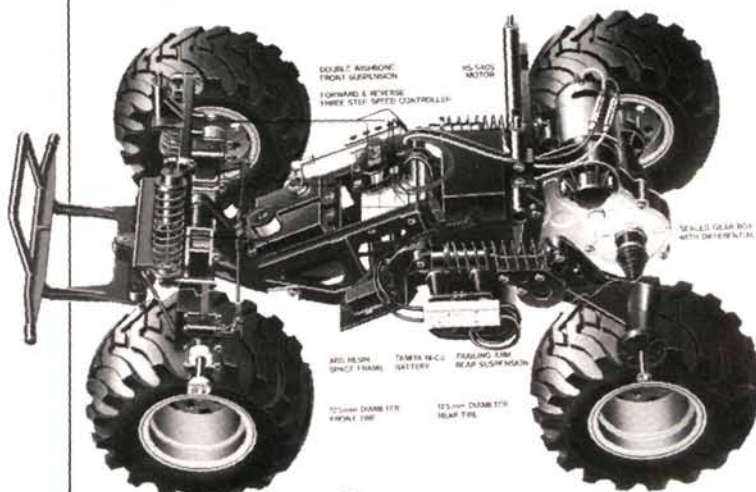


Above: The Blackfoot in the groove. Below: Chassis detail shows use of some time-proven, durable Tamiya components. Below right: The end.

THE KIT. Starting at the front, heavy upper and lower swing arm links pivot off thick gauge aluminum suspension stays, making for a near bullet-proof front end. The bright red cross-braced ABS resin chassis halves are similar in design to those used in other Tamiya cars, as is the resistor type three-step forward and reverse speed controller. Incidentally, battery eliminator circuitry is also included, but the instructions illustrate setup with or without the BEC. The differential is of the automotive type with metal planetary and bevel gears.

Take note there are left and right beveled gears, so don't mix them up. Other niceties to be found are a trailing arm rear suspension, ball bearings for the splined output short shafts (a complete set is available), half-shaft rubber boot dust covers, a Mabuchi RS-540S motor, and an accessory pack with four-way box wrench, liquid thread-lock, grease, and switch conductive lubricant to name a few.

(Continued on page 68)

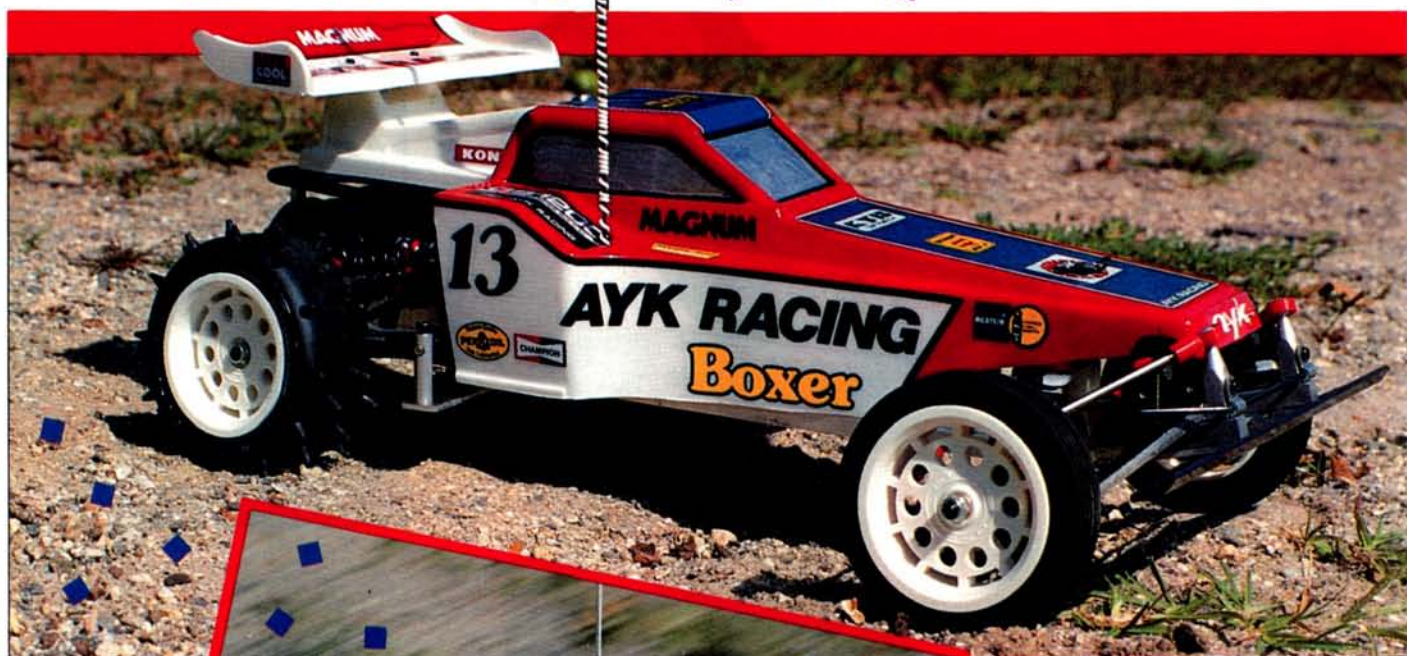


Track Report
AYK

BOXER

from RACE PREP

Knock out the neighborhood competition.



Photos by Louis V. DeFrancesco Jr.



by ART SCHROEDER

current, seems just a bit quicker than other off-landers I've driven. Of course, its speed is the result of gearing, motor power, mechanical drag, and power input. Gearing is fixed, but a variation can be obtained by using one of three available pinion gears. The kit provides the middle choice, a 13-tooth pinion. There are a variety of motors available depending on need.

THERE I am, neck and neck with the neighborhood off-road bully, on a vacant lot course designed to test any driver's skills with an unusually long straightaway. There are also rough areas, sand traps, water hazards, chassis-breaking leaps, sharp turns, and cut-backs. My neighborhood friend cheers me on as we approach the final long straightaway with our AYK Boxer from R/C Race Prep*, among the fastest cars I've ever tested on the straights. This is partly due to the ultra-light design and the motor.

The car is powered by a Magnum 360L and, on 7.2-volt

THE KIT. The latest Boxer has an all-new, improved ball differential, and also seems to be a little easier to assemble. It has relatively few parts and a simple chassis and suspension arrangement. Indeed, the chassis (or frame) is virtually all-metal, employing two frame pieces and three guards that align and strengthen the main frame pieces. So, too, aluminum is the material of choice for the single front-suspension arms. Aluminum also is found in front- and rear-suspension supports and rear shock arms. Suspension front and rear is aligned with support rods.

(Continued on page 78)

by JOHN MUNDY

Build Your Own Quick Charger

It's simple—and cheap!

SOME TIME ago I found myself in desperate need of a good quick charger and being an engineering student, I naturally decided to build rather than buy. What I ended up with was simple and straightforward, and contained all of the features found on commercially sold chargers, but at a much higher price. Built into this design are such features as an ammeter, AC/DC input, 30-minute timer, and double-fused circuitry. The best feature is that you can build the charger yourself, with all the parts except the timer coming from your friendly neighborhood Radio Shack. The timer can be easily found at any electrical supply store.

CONSTRUCTION. This design is so simple that you can build it just from following the schematic in this article, but there are a few notes that I'll need to point out.

Before you start assembly, lay out all the components and get their general location down before you start drilling holes and bolting the transformer and bridge rectifier to the chassis. The casing I used has sufficient room for all the components, but when assembled there is not much space to spare. Also before assembly you'll need to solder the capacitor to the positive/negative posts of the bridge rectifier. You'll notice that the capacitor is also marked with + or - and you'll need to get the polarity right when you solder the device on.

The next step is to solder the ceramic resistor to the positive/negative posts on the ammeter. Don't worry about polarity here, as the resistor will work in either direction.

Now you need to drill the holes in the casing chassis. There need to be four holes on the back, two for the AC and DC input cords, and two for the fuse holders. On the front there will need to be the hole for the ammeter yoke. This hole will have



Teach yourself the fundamentals of R/C electronic charging by building this charger, complete with amp meter, 30-minute timer, and AC/DC input.

PARTS LIST SUPPLIER: RADIO SHACK

Description	Stock Number	Quantity	Price
Case	270-253A	1	\$4.99
Resistor	271-130	1	.49
Ceramic Capacitor	272-1044	1	.89
Transformer	273-1511A	1	6.99
Fuse Holder	270-364A	2	.89
Fuse Pack	270-1262A	1	1.89
SPST Switch	275-612	1	1.59
12V DC Light	272-331	1	1.69
Ammeter (1A)	270-1752	1	7.49
Grommets (pk)	64-3025	1	.99
Wire (18AWG)	278-1303	1	2.19
Lighter Plug	274-331	1	1.19
Power Cord	278-1255	1	.79
Bridge Rectifier	276-1185	1	2.69

SUPPLIER: ELECTRICAL SUPPLY STORE (any)

30-Min. Attic Fan Timer	1	6.50 (approx.)
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Total: \$41.26

NOTE: If you use your own wire, power cord, and fuses, and buy the items on sale, you can expect to pay only \$30.00 to \$35.00 for everything. I just used parts that were in broken appliances and built this same charger for \$28.00.

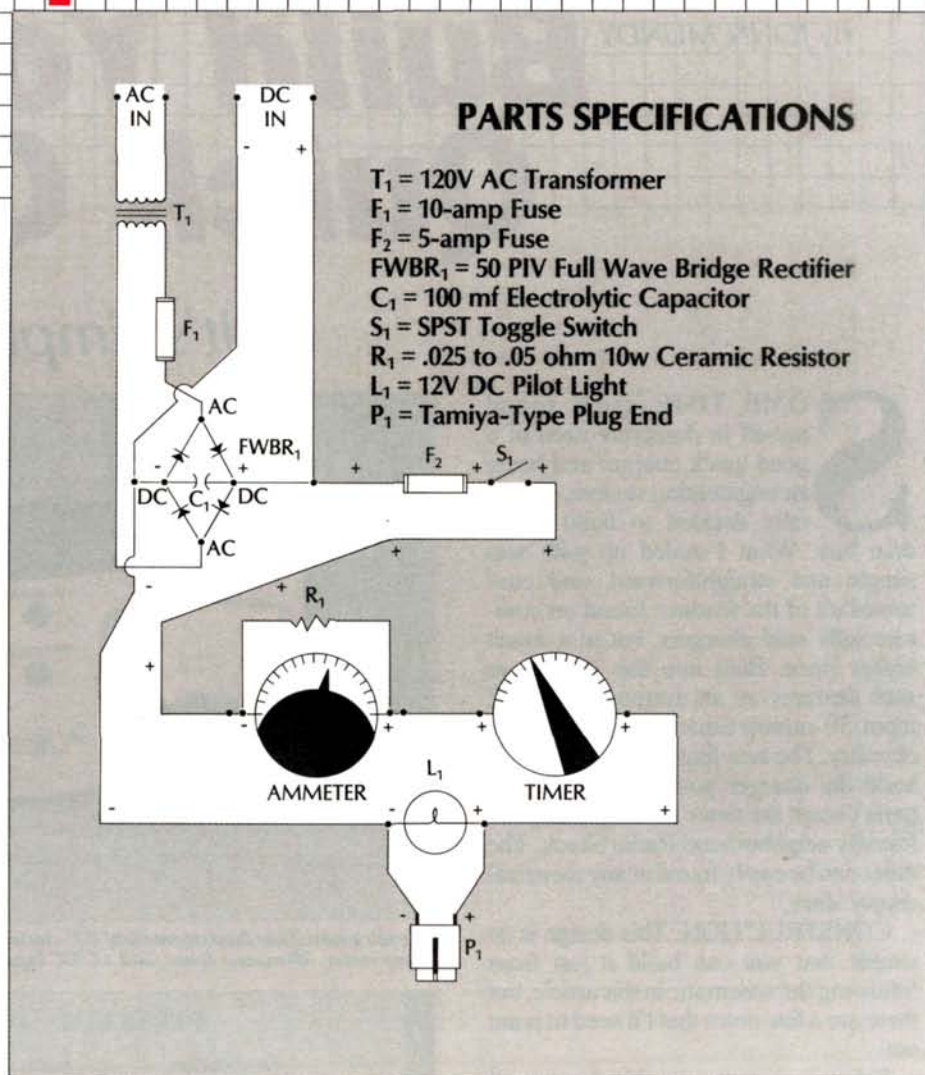
to be cut rather than drilled because of its size of approximately 1 1/4 inches. Do this by either using a hole punch, or, like I had to do, drill a series of small holes in a circle and use tin snips to cut the piece out. Next, drill the hole for the master On/Off switch, charging light, and battery charge cord.

Using the drawing, wire the various components together, but *watch the polarity*. It's always best to use red for positive and black or white for negative because you can then tell the polarity of a wire at a glance.

This charger is a simple design so it should take you no more than a few evenings to construct. Another nice feature about this device is that you can later add other functions to it, such as a charge/discharge switch, peak detection, or a separate circuit to charge your radio's battery pack. If you care to write, I'll be glad to supply the additional information.

Happy modeling and good luck on your new charger!

John Mundy, c/o *Radio Control Car Action*, 632 Danbury Rd., Wilton, CT 06897. ■



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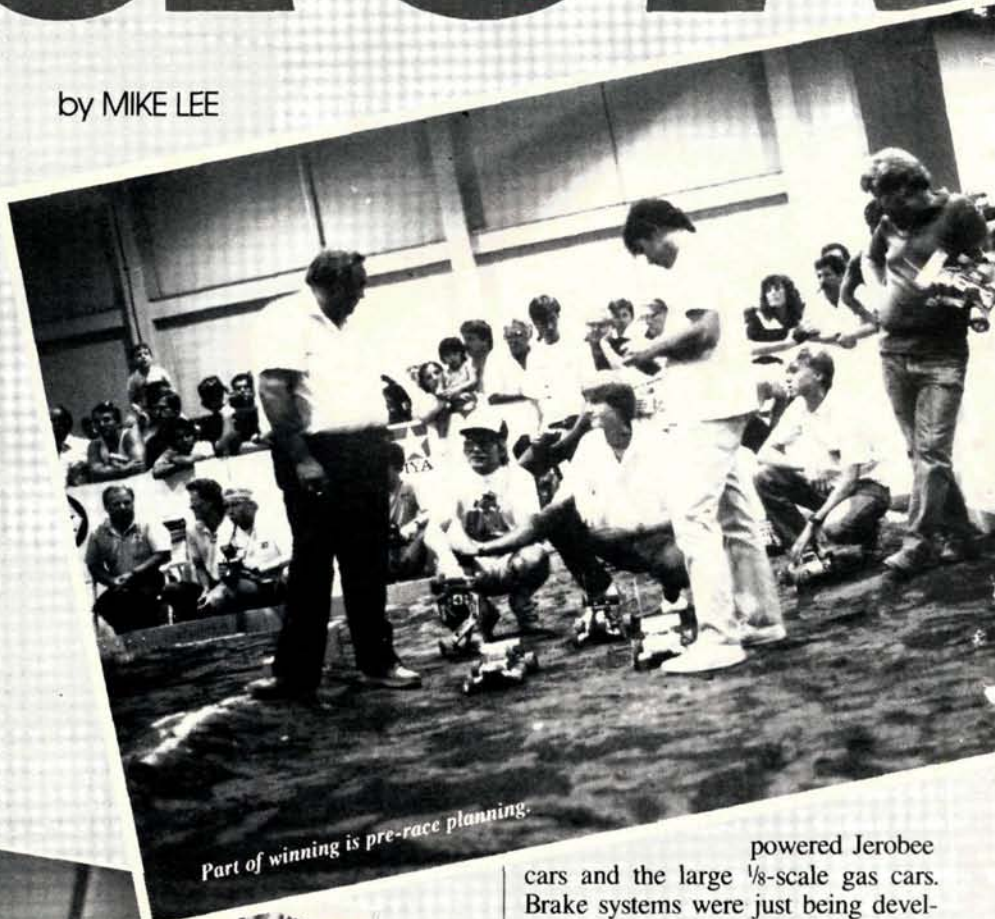
Inside Track

WELCOME to "Inside Track." This column is dedicated to sports-minded drivers who wish to learn about cars, techniques, tracks, products—in short, anything there is about R/C cars.

In introducing this column, let me tell you a little about myself. You might know me from my article "Suspension Systems" and from various Track Reports. And those readers who also read our aircraft counterpart magazine, *Model Airplane News*, will know me by this same column title for the past two years.

My racing experience started quite some time ago, as I was originally involved with the fabulous slot cars during the late '60s. When the popularity of slot cars died suddenly, most all of us turned our attention to the then-blossoming sport of radio-controlled car racing. Back then, the most common cars were .049-

by MIKE LEE



Part of winning is pre-race planning.

powered Jerobee cars and the large $\frac{1}{8}$ -scale gas cars. Brake systems were just being developed for the gas cars, and the wheel radio was only a thought.

Since then, most of my time has been occupied flying competition R/C aircraft, until the advent of reliable electric-powered cars. That did it. I was back into racing, not as a contender for any national title, but as a fun-loving sport-racing enthusiast just like most of you.

But enough of me, let me get right down to business in this column by helping you help yourself. This month, I want to discuss driving technique, because every one of you has to drive the car in order to have fun and race.

Driving technique is much like learning tennis. There are individual styles of driving, but there are also some very basic rules that will make you better.

(Continued on page 113)



Concentration is the keynote for getting through the turns.

MRC BLACKFOOT

(Continued from page 60)

ASSEMBLY. Tamiya instructions are so complete and accurate that to deviate even a little is a mistake. On the left-hand side of each page is a column of parts to be used in the adjacent step. If a part or a screw doesn't exactly match the actual size picture in the parts column, rest assured you've got the wrong part! The instructions are that precise.

When I assembled the friction shocks I paid no attention to the spring size and soon found I had a much stiffer right front suspension than a left. As it turned out, the rear springs are slightly heavier than the front, and well they should be. Sure enough, I matched up all four springs to the instructions and there were two front and two ever-so-slightly heavier rear. The difference was miniscule, but accurately noted in the booklet. Enough said.

All in all there are 39 detailed steps to guide you, so take full advantage of them. In doing so, I was able to complete my Blackfoot in nine hours. If you find at completion that you have a few parts left over, don't be alarmed. As I've already stated, the Blackfoot does share some components with other Tamiya cars, so the extra parts left on the parts tree were never meant for use on the Blackfoot, but for another car.

By the way, I purposely used no paint in this kit to illustrate the colorful model arrived at *sans* brush. What you see is what you get, from the smoke windshield

to the red undercarriage. As you can see from the photos, the FOOT is truly a stand-out machine with its yellow wheels and bright decals. Of course, if you so desire, red tail lights, yellow parking lights, and silver door handles could be added, but who would really notice with such a brilliantly colored truck?

PERFORMANCE. With its 5-inch monster wheels, substantial ground clearance, smooth differential, Mabuchi RS-540S motor, light weight, undercarriage skid plate, and high-flex servo saver, one would suspect the Blackfoot is ready for the badlands—and it is.

Louis DeFrancesco Jr., known to those close to him as the "Abuse Master General," certainly lived up to his name during the photo session. Multiple jumps off 2-foot high ledges, hill climbs, rocky roads, tumbles down the other side of hills, and continued running in soft sand—which the FOOT handled very well with its large paw prints—were the prime directives of the day. The truck also tracked very well on pavement, much to my surprise. If you intend to run your truck on pavement often, I recommend going with a reduced steering rate and making sure you have a few degrees of toe-in as you would with off-road use.

As I've previously mentioned, the Blackfoot has needed no adjustments since assembly. The truck is tough. So, if you're the type who loves to "rock" with the mud and "Stones," the Tamiya Blackfoot is definitely for you.

**The following is the address of the company mentioned in this article:*

MRC/Tamiya, Model Rectifier Corporation,
2500 Woodbridge Ave., Edison, NJ 08817. ■

O.S. MAX CZ-1

(Continued from page 13)

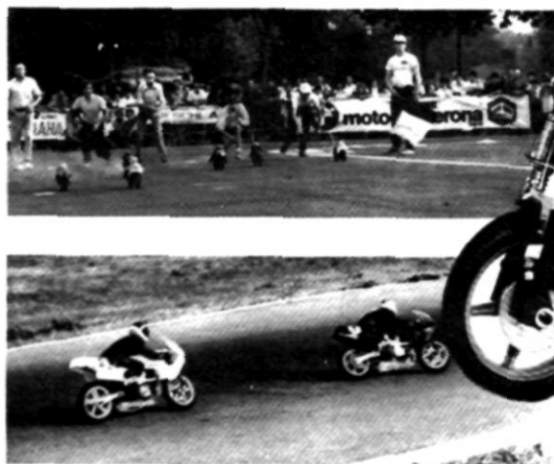
factory set and the remaining adjustment available to the user is strictly limited.

In place of the normal needle-valve control, the CZ-1 has a special large diameter mixture control screw installed in the left side of the carburetor body. This has an O-ring to maintain its setting in the carb body and an outer disc by which it can be moved, but only through about 30 degrees each side of a basic setting. Within the body of the screw there is a separate needle which is factory set, its screw-head being sealed with a black rubber plug which the user is instructed not to remove. The adjustment left to the operator is sufficient to allow the engine to be run a little rich during the break-in stage and, later, to re-set the mixture strength for maximum performance. Thus, the risk of setting mixture wildly out of adjustment is virtually eliminated and, provided that the user sticks to the procedures given in the O.S. instruction leaflet, no difficulties should be encountered.

As previously mentioned, the CZ-1 is of advanced design and high quality

(Continued on page 78)

COMMANDO - Radio controlled motorbike racer



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TROUBLESHOOTING YOUR TWO-STROKE ENGINE

by JERRY STONE

THE TWO-STROKE engine is one of the most simple, yet powerful creations used to run our models. Efficient, it's not. Nor is it quiet. Yet for our gas-powered cars, the two-stroke engine has found a permanent home.

All model engines purchased today are of excellent design and workmanship, the development path to this point having been paved by hundreds of examples of modelers' efforts to create a reliable, lightweight, and powerful mode of power. Each engine was a learning tool from which future engines would be refined.

You'd think that after nearly 60 years of practice with two-stroke engines we modelers would have the operation of these little gems down to a science. Well, yes and no. Although they're probably the epitome of simplicity, they can also be downright devilish sometimes, making even the engine experts at a loss in finding or explaining a problem.

Many modelers seem to think a sick engine will cure itself! Hardly ever is this the case. Just like a doctor, you must first identify the problem or symptom, locate the source of the ailment, and administer proper treatment to cure its ills. This is not as easy as it might seem since many different things can cause the same symptom, and if we have more than one problem area, the chances of isolating them can become downright frustrating.

Let's look at a typical engine/tank setup. We have the engine, fuel line, and fuel tank. If we have a pump, filters, valves, etc., added to this system, then we compound our potential for problems as well as our ability to isolate the trouble spot. In troubleshooting any problem the first thing we must do is reduce the system to the lowest number of possible components. Of course, some things become immediately apparent, like if you see fuel running out the bottom of your car! A loosely mounted engine will never perform properly, plus it will shake the

ENGINE



Two-stroke engines have minimum parts count but can still present problems.

daylights out of your radio components as well as causing your fuel to foam. The same thing can happen if you use an out-of-balance flywheel.

It can be a pain in the neck to remove an engine and fuel tank from our cars, but a little effort and patience will really pay dividends. Sometimes there's no other choice, especially if you've checked all of the more obvious things, like lines, filters, plug, fuel, mounting screws, head screws, and carburetor. If they all check out okay, then pull the tank. First check to see that the clunk is on the pick-up line and that none of the fuel lines are split. Seal off the tank and then pressurize it, looking for air leaks. Check the brass tubing for the pickup and vents to make sure they're not split or cracked. Also make sure there are no water droplets in the tank. If the tank, lines, and filters all check out okay, your attention then must go to the engine.

Visual examination can often reveal a problem. First, make sure all the screws are in place. For example, if a backplate screw was loose and that screw hole was open to the crankcase, you'd be losing your crankcase pressure as well as suc-

tion at the carburetor. And speaking of carburetors, see that it's seated properly in its mount and that the screws securing it are in place.

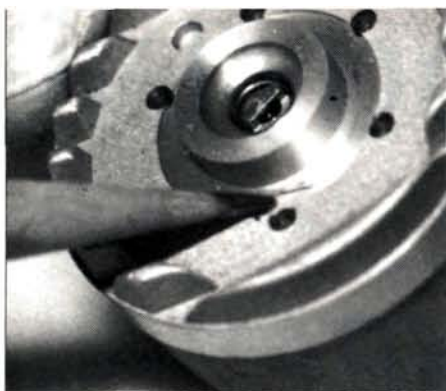
Check the exterior of the engine closely for any cracks, especially around the mounting lugs. If you detect any, you have a good candidate for the scrap heap. If there are no visible signs of cracks, leaks, or defects in the case or carburetor, all the screws are tight, the plug is good, and the fuel known to be good, the only place left is inside the engine itself.

Remove the head, backplate, and front housing (if your engine has one) and pull the piston liner. If you have a ringed engine, be careful not to damage the ring, as they break very easily. Most ringed engines have a retainer pin which keeps the ring from rotating. If you remove the ring, make sure you observe this pin and reinstall the ring exactly as it was removed. If you don't, and you try to place the piston back in the liner, you'll break the ring immediately. Be extremely cautious here.

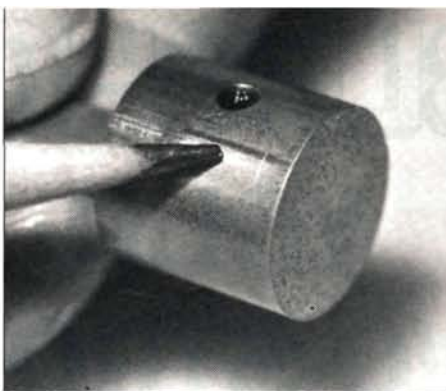
When disassembling an engine I always use a plastic container to put all of the screws and small parts in so I can find them later.

With the piston and liner out of the engine, put the crankshaft in place with a little oil (gun oil works well) and spin it in the case. It should spin freely and wobble back and forth as the counterbalancer seeks the lowest point. The counterbalancer is always opposite the crankpin. If it does not spin freely, or feels rough when you turn it by hand, chances are you have a bad set of bearings or the bearings are not set properly in the case or are misaligned. Sometimes you can straighten them out and sometimes the case is warped beyond cure. A tight crankshaft can cause overheating and seizure, or simply give you fits with erratic runs.

Inspect the crankshaft for any abnormal wear. Score marks where the bearings are located mean that the crank is spinning on the housing of the bearing,



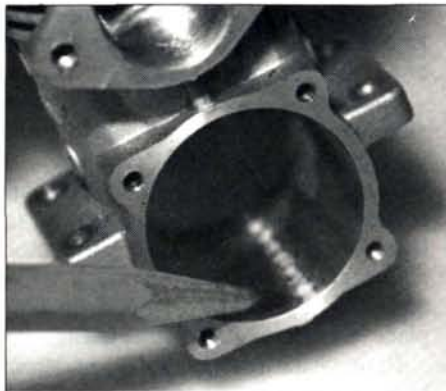
Look for scores on seat which cause compression loss and uneven temperature distribution.



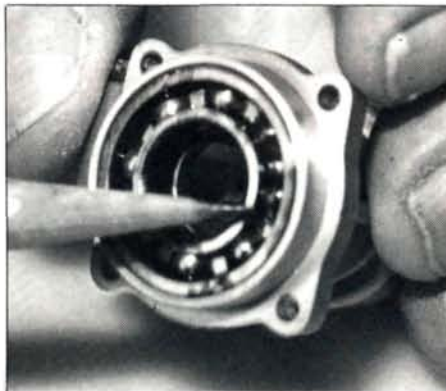
Vertical score on piston was caused by foreign debris.



Circular marks on crankshaft indicate improper seating of bearing.



Check crankcase housing for rough spots and cracks.



Bearings should be corrosion-free.



Circular marks on backplate show where crankshaft rubbed.

(Continued on page 112)

TWO-STROKE TROUBLESHOOTING CHART

RUNS ERRATIC OR HOT

Engine not broken-in
Fuel line too small
Glowplug shorted
Glowplug blown
Bad fuel
Air leak in tank
Air leak in line
Debris in fuel line
Kinked fuel line
Carb leaking air
Debris in filter
Clogged needle-valve
Loose engine
Foaming of fuel
Loose head
Loose case screws
Loose plug
Bad plug gasket
Leaking glowplug stem

Blocked fuel vent
Pickup in tank off
Crack in crankcase
Varnish in engine
Bearings worn out
Bearings defective
Bearings misaligned
Crank rubbing backplate
Split tubing inside tank
Flywheel too large
Improper carburetor setting
Improper tank location
Flywheel out of balance
Flywheel too small

RUNS LEAN, WON'T RICHEN UP

Too much nitro
Improper lubricant
Defective plug
Compression too high
Fuel line too small
Fuel line clogged
Air leak in tank
Air leak in line
Air leak in carb
Head screws loose
Case screws loose
Improper carb setting
Improper tank location
Fuel vent blocked

WILL NOT START

No fuel
Flooded
Dead battery
Defective plug
Bad fuel
Defective leads
Loose plug
Loose head
Improper connection
Wrong carb setting

WON'T IDLE

Bad plug
Bad fuel
Loose carb
Wrong carb setting
Case screws loose
Head screws loose
Plug loose
Fuel line too large
Leak at carb base

VIBRATES

Flywheel not balanced
Bearings shot
Rod is bad
Crank not aligned

RUNS A SHORT TIME—QUITS

Pickup off in tank
Clunk off line
Defective plug
Clogged filter
Clogged carb
Loose carb
Loose needle
Plug bad
Improper tank location
Blocked vent
Fuel line too large

O.S. MAX CZ-1

(Continued from page 68)

construction. It is an ABC type engine, using a ringless aluminum piston running in a thick-walled brass liner having O.S.'s special ultra hard wearing nickel-based composite all-over plating. A Schnuerle-plus-third-port scavenging system is used. The cylinder head has a bowl-and-squish combustion chamber and neat tapered cooling fins.

The main casting, comprising crankcase, front housing and cylinder casing, contains two 9x17 mm ball journal bearings to support the one-piece hardened steel crankshaft. The 9 mm diameter shaft has a 6.6 mm bore gas passage fed from a 10 mm long valve port and its 4 mm crankpin has a 3.2 mm diameter spigot that engages a slot in the starting shaft drive disc. The starting shaft runs in an 8x16 mm ball bearing at the outer end, supplemented by an 8 mm i.d. bronze inner bush, both bearings being contained in a substantial rear housing. The starter cone has a diameter of 29.4 mm, is keyed to a flat on the shaft with a headless set-screw and is firmly retained with a special hex socket round head screw.

The Max CZ-1 obviously has the makings of a very powerful little engine and we were not surprised to learn that the production motor is a detuned version of the prototype which proved to be too powerful for the intended buggy application.

The engine comes fitted with an O.S. No. 8 glowplug and a glowplug wrench and starting cord are also supplied.

Peter Chinn, c/o Model Airplane News, 632 Danbury Rd., Wilton, CT 06897. ■

GRASSHOPPER

(Continued from page 30)

When the speed controller was in place, I moved forward to the beefed-up suspension we'd worked on earlier. To complete the front assembly and to complement the suspension changes, I added a heavy-duty steering package as extra insurance that popped tie-rod wasn't going to ruin a fine performance. The CRP Grasshopper heavy-duty steering (No. 1604) provides a ready-fit, easy-to-install steering assembly that gives peace of mind and performance needed by any racer.

To add the finishing touches to this project, Parma has a three-point aluminum nerf bar set (No. 13277) that gives the Grasshopper the extra side protection and eye appeal we all like. Next I added high-traction tires, Parma front-spiked tires (No. 12011) and CRP rear dynamite spiked tires (No. 4213). The only eye-appeal items yet to add were CRP chrome wheels, a Parma Stinger body, and the new Pro Line universal front bumper.

The Pro Line universal bumper is the extra wide protection needed to make sure the competition doesn't get in the way of your dash for the checkered flag. It gives the Grasshopper the extra steering and suspension protection that could be the difference between not finishing the race and winning.

The Project Grasshopper machine took on an awesome look so I set out to see if the Hopper had as much go as show. The track test of this car was an exciting experience. Warm-up laps were taken with some caution and a few minor suspension adjustments were made, but once all was settled, I put the juice to it. That Grasshopper kicked up its heels and was gone. Jumping and handling abilities were remarkable, not to mention the speed with which the hopped-up Grasshopper tore around the track. Just think, you can create a killer insect out of an innocent starter car.

Give your Grasshopper a chance to grow and spread its wings, and you won't hop, you'll leap past the competition!

**The following are the addresses of the companies mentioned in this article:*

MRC/Tamiya, Model Rectifier Corporation, 2500 Woodbridge Ave., Edison, NJ 08817.

Parma International, 13927C Progress Pkwy, N. Royalton, OH 44133.

Custom Racing Products, P.O. Box 1485, Dept. 6-F, Temple City, CA 91780.

Pro Line USA, P.O. Box 456, Beaumont, CA 92223. ■

AYK BOXER

(Continued from page 62)

There is a mono-shock for the front end and dual shocks at the rear. The shocks are oil-filled and coil over. A torque stabilizer bar is included on both front and rear suspension. Both front and rear are solid and capable of handling just

(Continued on page 86)

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Detailing

by RICH HEMSTREET

Detailing with MRC/Tamiya paint markers.

MRC/TAMIYA* has come up with a quick and easy way to add detail to R/C cars and drivers. You don't have to get out the brushes, rags, and paint bottles anymore, just reach for the MRC/Tamiya Paint Markers.

Paint Markers come in a variety of colors. They look like felt-tip markers, but you can feel a ball moving inside when you tilt it. The marker is actually a small spray can with a felt-tip applicator instead of a spray nozzle. You have to shake it hard to get the paint flowing, but be sure to have the cap on when you shake it, or the paint can splatter off the tip.

The markers are very neat. Instead of washing out brushes, just snap the caps back on when you're done.

The felt tip is designed so that you can make either a fine line or a broad stroke. If you have a steady hand, you won't have to do any masking.

The paint in the marker is enamel. Be sure to test it before you trust it. I've had this paint stick on some Lexan bodies, yet I've had to use a clear undercoat on other bodies before it would stick. Be sure to test the paint on a scrap piece from the same body you're working on.

Clear drivers can be painted from the inside before the car body is painted. You can also paint vents and ducts from the inside with the Paint Markers. And there is a flat black that can be used on the outside of car bodies to make vents and ducts look more realistic. Just be sure to paint the duct both inside and out, as the flat black will get chipped off the outside from wear and tear.

When you have a solid-color driver, just go ahead and paint him from the outside. If he is stuck into an open-cockpit car you may have to touch him up occasionally, but that is easy to do with the MRC/Tamiya Paint Markers.



The MRC/Tamiya Paint Markers create a more colorful driver.



Closeup of well-designed tip.



Paint Markers work fine for details on clear bodies.



The face shield is first painted a dark green.



Royal blue gloves are now added to the driver.



As a finishing touch, an Autographics decal is added to the driver's helmet.

**The following is the address of the company mentioned in this article:*

MRC/Tamiya, 2500 Woodbridge Ave.,
Edison, NJ 08817. ■

AYK BOXER

(Continued from page 78)

about anything thrown their way.

The balance of parts are glass-filled nylon or other plastics with the usual clear Lexan body covering up everything. The control features include a built-in servo-saver on steering and a 3-speed forward, variable power control with braking and reverse.

The use of aluminum as a main frame component, and also at other strategic spots, enables the Boxer to handle the roughest treatment. The parts are on par with those in any other kit, and everything needed—except radio, battery, and paint—is included. Boxer's instructions have a serious flaw: they're mostly in Japanese with terse English translations. It's mainly in the area of chassis and suspension adjustment that I felt a little lost. I finally set front wheels with a bit of toe-in and zero camber—it all seemed to work well in my runs. Even with that criticism of the instruction's verbal component, I must say the step-by-step isometric drawings are so beautifully done that I had no problems of any kind except for the aforementioned adjustments. This is one car that anyone is capable of assembling, beginner or expert alike.

The Boxer finished up at a weight of 3½ pounds with radio and all accessories. Approximately 70% of vehicle weight is on the rear wheels, which is about normal for a rear-wheel-drive car. Wheel base is 10.3 inches and tread is 7 inches. All in all, this is a very stable car and easy to steer around any course when properly adjusted.

PERFORMANCE. Boxer proved itself to be very quick. I ran it initially on my favorite track, a paved road outside my home. It ran straight and turned quickly—too quickly at first! I toned this down by moving one hole out on the servo saver arm. On rough terrain, the machine handled several circuits including some nasty jumps that have damaged other cars. My typical times seemed better on my personal off-road track (my backyard), but some real racing is needed to prove this. After a couple of hours running, I found no chassis problems, loose components, or excessive wear. So far, Boxer has been one of my least troublesome cars.

I used AYK's 7.2-volt battery as a power source. I don't know the manufacturer of the cells, but the battery gave

runs equal to any I'd used before. I haven't taken any drain readings on the 360L Magnum motor, but for the power it puts out, it seems quite easy on the batteries giving very long runs.

The Lexan body was painted with acrylic paints brushed on from the inside in the usual fashion. A very nice vinyl transfer sheet gave all the sparkle I needed.

I really enjoyed this car and I think you will too. It's a fine kit that assembles into a potential winner. Ball bearings and hotter motors are available to help when greater performance is needed.

Next time the neighborhood off-road bully starts a round of verbal intimidation tactics, be prepared—with a super-fast AYK Boxer from R/C Race Prep.

**The following is the address of the company mentioned in this article:*

R/C Race Prep, 20825½ Roscoe Blvd.,
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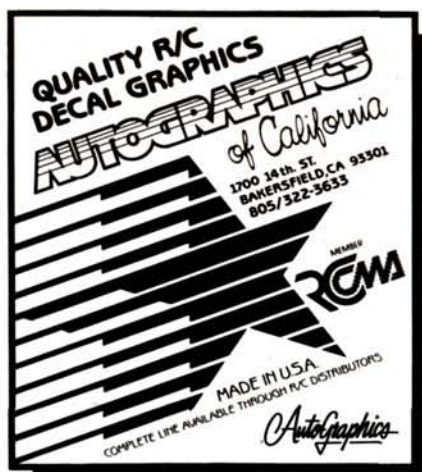
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KO EX-5

(Continued from page 20)

I ran this particular radio system in my John Player Special and it performed flawlessly. In summary, the KO Propo EX-5 is a very well made, uniquely styled two-channel system. The KR-285A receiver is small, and with two servos and a receiver battery eliminator makes a radio installation weighing only 6 ounces. If you're in the market for another car or boat radio, take a look at this, a fine radio among the high-quality Hobby Shack collection.

See you next month.

Charlie Kenney, c/o Radio Control Car Action, 632 Danbury Rd., Wilton, CT 06897.

*The following is the address of the manufacturer mentioned in this article:

Kondo Kagaku Co.: distributed by Hobby Shack, 18480 Bandilier Circle, Fountain Valley, CA 92728.

AIRBRUSHING

(Continued from page 17)

angled away from the card. It might take two or three passes with the brush to get the right effect. Then move the card down about an inch at a time, spraying as you did the first one, until you get a series of lines. Practice this until you can get them even. If you used a light main color, such as orange or yellow, you must back it up with white so the shading doesn't bleed through.

When doing this type of design, you'll paint a second color over this. The two colors will blend into each other, so remember this when you choose your colors for they must blend well together. One way to do this is to always use silver or white as the second color or black as the first so whatever color you use should work well.

Now that you've chosen the color, wipe off the section about to be painted with Prekleano, which will not remove any paint you've already applied.

Begin by sitting the body on something so you can have both hands free. You may have to trim the card to fit in certain bodies so it will stay flat during spraying. Place the card about 1 inch from the main color on the stripe about to be painted and begin spraying. Move the brush from side to side, stopping at the ends. Move the card down about 1 inch at a time, spraying as you go, until completed. Then take the second color and go over the area just sprayed. Two coats should be sufficient. This type of design is best left

(Continued on page 96)

What's New

Descriptions of new products appearing on these pages were derived from press releases supplied by the manufacturers and/or their advertising agencies. The information given here does not constitute endorsement by **Radio Control Car Action**, nor guarantee of performance or safety by **Radio Control Car Action**. When writing to the manufacturer about any product described here, be sure to mention that you read about it in **Radio Control Car Action**.

NEW FROM GREAT PLANES



A year of strenuous research and testing has given the Kyosho Ultima a completely new state-of-the-art design. An impressive list of standard features is highlighted by the Ultima's supertight and durable monocoque aluminum frame. The EX-66 nylon suspension system that made Kyosho's four-wheel-drive Optima such a consistent winner has been adapted and improved for the Ultima. Other stock features include an aerodynamically functional wing and low-profile pin-spike tires. The Ultima has been designed and engineered to set the industry standard in two-wheel-drive off-road competition.



The SuperTigre S-21 ABC and S-25 ABC Buggy engines provide incredible acceleration, reliable performance and amazing top-end speed. Available with a built-on rear start cone that simplifies starts, or without cone, these engines feature Schneurle porting, ball-bearings, and ABC piston/sleeve construction for superior performance. Built for blistering speeds and trouble-free operation.

The Kyosho Pulsar Pro 2000 Radio contains many features that set it apart from other two-channel radios. It can be easily converted for left-handed use and the throttle trigger position is adjustable for virtually any hand size. The extremely comfortable Precision-Balanced design is so unique that it's patented. Servo reversing-switches located on the Pulsar transmitter allow instant change of servo direction. The Pulsar's compact KS-88 servos will fit in almost any R/C car but still have 34 inch-ounces of torque power. Keeping weight and space considerations in mind, Kyosho has made the KR-2M Mini Receiver stock on the Pulsar.



The Hobbico 12-Volt Multi-Charger is perfect for charging a wide variety of NiCd battery packs. It will fully and quickly charge the 4-, 5-, 6-, and 7-cell battery packs commonly used in R/C model cars. It features an all-metal case for durability and good heat dissipation. Current output is completely adjustable and the on-board power meter will give you an accurate reading of output—overcharging and undercharging become problems of the past. A handy discharge switch makes it easy to cycle your packs and an advanced, electronic timer circuit signals the end of charging or discharging with a sharp audible alarm.



For more info on these exciting new products, see your local hobby dealer or contact Great Planes Model Distributors Co. (P.O. Box 4021, Champaign, IL 61820).



DYNA-Mast

Made of crystal clear resilient plastic, this 17-inch-long antenna mast stands straight and holds its shape long after other antenna masts have turned into pretzels. Its exclusive safety tip not only protects eyes from sharp edges, but also keeps the antenna wire where it belongs, ensuring excellent signal reception with positive control and less antenna wire maintenance. Should your DYNA-Mast become bent or twisted during a rough-and-tumble elimination heat, just hold the antenna mast straight while heating it with hot air from a hair dryer and as soon as the DYNA-Mast cools, it will retain its straight shape again. For more info contact: Neron Associates (P.O. Box 348, Germantown, MA 02874).



IT'S THE MRC/TAMIYA BLACKFOOT!

This 1/10-scale two-channel R/C truck has got what it takes. Its massive 5-inch-diameter tires named this vehicle as their monster tread sits on all four corners. The ABC-resin space frame keeps the chassis light, strong—and easy to build! The thick resin-bumper protects the chassis and pushes minor obstacles out of the way. A powerful Mabuchi RS-540S motor was chosen, hooked to a 3-step forward and reverse speed control. A sealed gear box with a differential puts the power through rubber boot-covered hex universal joints to the rear wheels for torque and speed. The body is the rugged Ford pick-up, with the accurate detailing found only on MRC/Tamiya injection-molded parts. For more info, contact: Model Rectifier Corp. (2500 Woodbridge Ave., P.O. Box 267, Edison, NJ 08817).

NEW FROM PARMA

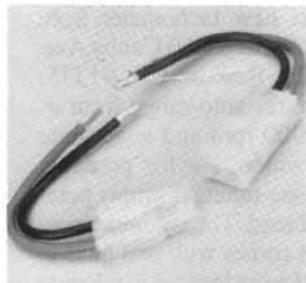


The Desert Dog body, No. 10237, is available in clear Lexan and is designed to fit the stock Kyosho Optima mounts. Its aerodynamic design eliminates the need for a wing.



Parma now offers its famous Super Gripper Hood Pins (No. 8039), bent for easy installation and removal. And of course they stay clipped in those inevitable crashes—to keep the body secure.

These products are available from Parma Products (13927 Progress Pkwy., N. Royalton, OH 44133).



Tamiya Connectors are the standard for off-road racing and Parma now offers them pre-wired, No. 11501, for your convenience. New batteries or motors require only soldering on the leads and they're ready for use.



These Timed Motor Brushes, No. 3577, add performance to stock Kyosho and Yokomo motors. When installed, they advance the timing of the motor for more rpm and speed. In stock-motor racing classes these could take you to the top of the heap!

What's New

NEW REALISM FROM CRAFT-AIR



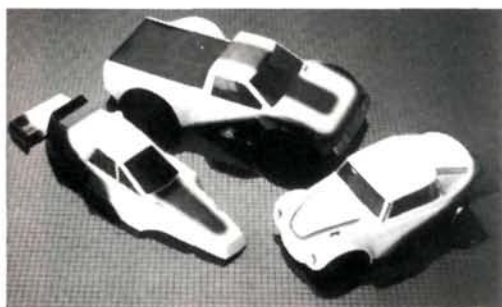
Craft Air (6860 Canby Ave. #120, Reseda, CA 91335) now brings new realism to R/C cars with realistic engine sounds that are directly proportional to engine speed, and auto on-off night-driving lights. The Engine Noise Simulator is housed in a chrome-plated injection-molded beer keg, commonly used by numerous hot-rodders and off-road racers as gas tanks. The Night Light System uses sealed-beam headlights that light up the track in front of the car and have red bulbs in the rear to quickly determine direction at night. By sensing ambient light, this system automatically turns on at night, or when in dark areas such as a closed garage. The Night Light System will add hours of driving time, especially during the winter months. Both the Engine Noise Simulator and Night Light System install easily using a simple two-wire hookup. Space-age solid-state circuitry requires minimal energy consumption.



DIGITAL DISPLAY TACH/VOLTMETER

This new tachometer from Craft-Air (6860 Canby Ave. #120, Reseda, CA 91335) features auto-range from 0-20,000 rpm and is accurate to within 1% for precision engine-tuning—simply point and read. The voltmeter portion comes with two built-in lead pairs located in a handy rear storage compartment. It places a load on the NiCd's to simulate actual use, can be used to cycle batteries and is accurate to 1/10 of 1%! The Craft-Air Tachometer/Voltmeter is only 4x3 1/8x1 3/16 inches.

THREE HOT NEW STYLES FROM PRO-LINE



Class One Racing Buggy. Fits RC-10 and many more.

Hardbody Truck. Fits most two- and four-wheel-drive 1/10-scale buggies.

Modified Baja Bug. Fits Hornet, Grasshopper, Frog, and most other 1/10-scale cars.

For more info on these products contact: Pro-Line (P.O. Box 465, Beaumont, CA 92223).

NEW FROM CRP



The 8002 Basic Upgrade Kit for Hot Shot and Super Shot contains four CRP items: No. 1028 battery tray; No. 1650 A-arm stabilizer; No. 3046 nerf wing; and No. 2158 motor endbell cover-foam.

The 8003 Basic Upgrade Kit for the Wild One includes four basic CRP items: No. 1602 rear adjustable coil-over; No. 1609 steering kit; No. 3040 front bumper; and No. 2158 motor endbell cover-foam.



The 8001 Basic Upgrade Kit for Hornet and Grasshopper includes three CRP parts: No. 1604 h.d. steering, No. 2158 motor endbell cover-foam and Nos. 4103 & 4104 front and rear chromed wheels.

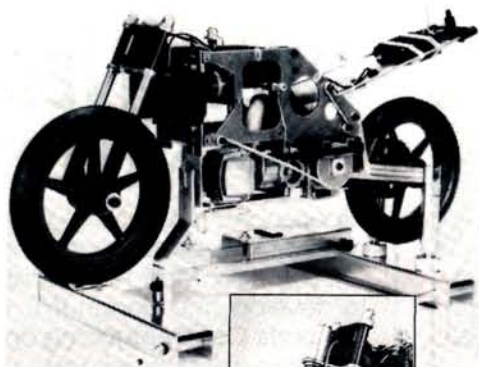


The 8000 Basic Upgrade Kit for Frog and Brat contains five different CRP parts: No. 1603 h.d. steering; No. 1606 rear suspension supports; No. 1608 differential bearing supports; No. 3043 chassis stiffener; and Nos. 4103 & 4104 front and rear chromed wheels.

For more info on these great offerings contact: Custom Racing Products (P.O. Box 1485, Dept 6-F, Temple City, CA 91780).

COMMANDO R/C MOTORCYCLE

The DWA Commando enables you to reach 100 km/hour in less than 5 seconds! Its outstanding features include easy assembly and setup, Primary drive with interchangeable gearing and secondary chain drive, and adjustable rear suspension with hydraulic shock absorber. Its speed and performance are equal to the very best race-car models. It's pre-set for mounting any 3-5cc car engine, to be used with a two-channel R/C system.



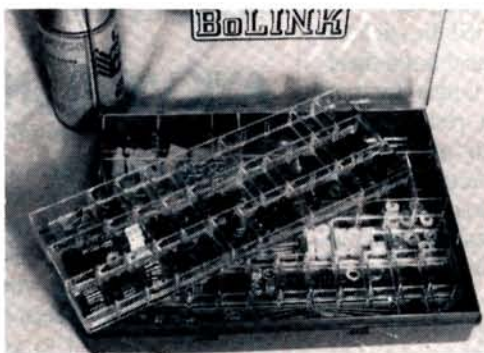
For further info, contact RPS Dist. (1655 Mission Blvd., Pomona, CA 91766).



NEW FROM BOLINK



BL-2007 1/12-scale Outlaw Firebird Wedge Body is made from the toughest polycarbonate available.



BL-6053-X Plastic Parts Box is perfect for keeping track of spare parts and tools. It's got three removable trays with dividers.

For info on these hot new products, contact BoLink R/C Cars Inc. (420 Hosea Rd., Lawrenceville, GA 30245).



BL-6024-B Power Plus motor power additive reduces amperes and increases rpm. Available in either 2-ounce bottle with applicator or 12-ounce cans (BL-6024).



BL-2500 new and improved Mr. Concours II Paint comes in 10 bright new colors for around R/C bodies, and is water-soluble.



SNOW CONVERSION KITS

Snowtime Accessories introduces their winter conversion kit for 1/10-scale two-wheel-drive off-road buggies. This kit converts your buggy to the newest and hottest snow machine. The kit includes skis and coupling adapters for rear wheels. For more info, please send \$2 to: Snowtime Accessories Ltd. (28-24 Central Place, Saskatoon, Saskatchewan, Canada S7N-2S2).

AIRBRUSHING

(Continued from page 88)

to one stripe, as too much takes away from the effect.

When doing this type of design, practice makes perfect. Once you master straight fades, try different shapes, such as curves or angles. The variations are endless. Use paper to practice until you feel confident enough to try it on a body.

Continue painting the other stripes until the body is completed. Let it dry thoroughly and then clean the outside with rubbing alcohol to remove overspray and fingerprints.

Now you're ready to complete with stickers. Once you've applied the stickers of your choice, Autographics* has a sheet called a "Sign Kit," which is ideal for that personal touch. For best results, wipe where you are about to apply with Prekleano. Use a new X-Acto blade and a mirror or piece of glass to cut these out on. You'll have to apply these one letter at a time and I've found that using a piece of 1/16-inch Fine Line tape across where these are about to be applied will help keep the letters straight. Once completed, spray the outside of the body with WD40 and polish.

Once you shoot a few of this type of paint job, it will start to become second nature. While you lay down tape, think of it as color while letting your imagination run away and you'll find ways to make colors enhance each other, making it easier and easier to arrive at yet another masterpiece.

The following are the addresses of the companies mentioned in this article:

MRC/Tamiya, Model Rectifier Corp., 2500 Woodbridge Ave., Edison, NJ 08817.

Parma International, Inc., 13927C Progress Parkway, North Royalton, OH 44133.

Autographics of California, 1700 14th St., Bakersfield, CA 93301.

works very well. It performs positively, like a four-wheel-drive should, with little complaint. And, with its hefty construction, it should last a long time. If a four-wheel-drive car is what turns you on, consider the AYK Viper Shuttle. You'll love its potency.

*The following are the names of the companies mentioned in this article.

Condor Trading Company International, Inc., P.O. Box 3479, Mission Viejo, CA 92690.

Parma International, Inc., 13927C Progress Parkway, N. Royalton, OH 44133.

MRC BIG WIG

(Continued from page 39)

manual is excellent with illustrations and steps so detailed that even a beginner won't have any trouble with this one. The left side of each page in the manual correspondingly shows the screws and small parts that are covered in each illustrated step. The drawings are also actual-size; so if you're confused on a certain part, you can hold it up to the drawing to see if you actually do have the correct part.

(Continued on page 99)

AYK VIPER SHUTTLE

(Continued from page 36)

to punch through hard corners without spinning out or ending up in a donut. The four-wheel-drive definitely was working. Another worry that goes away is high-siding the car. The all-wheel-drive nature of the Shuttle just keeps the car plowing where you want it to go. It gives that feeling of power! I love it!

In a nutshell, the AYK Viper Shuttle

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RC-10 (KIT) Team Asc (Nylon Brgs)		\$225.00	\$169.95 Ball Brgs - \$60.00 Extra

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CAR	2-CH RADIO	RETAIL	SPEC.
BUFFALO 250 (2-Stk)		\$229.90	\$159.95
FROG 250 (2-Stk)		\$239.90	\$159.95
RC-10 250 (2-Stk)		\$284.95	\$209.95

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MRC BIG WIG

(Continued from page 96)

The fifth page shows you which tools are needed to assemble the kit. I used Tamiya's master-grade tool kit, which is great. It comes in an attractive wooden case with everything needed to assemble or repair whatever car you might have.

Assembly begins with the radio installation, usually the most time-consuming step. The Big Wig, however, overcomes this by packing the speed control pre-wired to the BEC system. Everything plugs in so no soldering is required.

Be sure to have the transmitter in the neutral position when centering the servo so as to take full advantage of the adjustments available on the transmitter.

The only thing I can add to the instructions concerns step 17, in which I suggest you use some sort of thread lock on the setscrew for the pinion gear. Sometimes under hard use these have a tendency to loosen up. The kit comes with 13- and 15-tooth pinion gears. I opted for the 13-tooth for more running time and to get used to the car before trying for all-out speed. There are also 14-, 16-, and 17-tooth pinion gears available to get the car suited to your local track.

For the shocks, I used the soft setting, which seems to be the best for normal running.

When the car is completed, don't just go out and run it without the body. In addition to making your car look great, the body serves an important function, to protect the internal components of the car. You can paint the body several different ways. One way is to use an airbrush (or a ready-to-go aerosol spray), and another is to use Tamiya's polycarbonate paint. Once the paint is on, all that remains is to install the roll cage, driver, and apply the stickers.

PERFORMANCE. Before unleashing the wrath of this beast, as with any car, you must true the steering by running the car at slow speed and adjusting the steering trim so the car runs straight without veering to either side.

Once this was done, I opened it up and was shocked at the acceleration! I'd used the 8.4 Gold Power battery, one of the fastest of the box four-wheelers I've ever seen. The car really seemed at home on the track and ate up all that I gave it with astonishing speed. The car was just about impossible to flip because of its low center of gravity; and even when I did, it always landed on its wheels. It handles jumps very well and can be tuned to your

(Continued on page 106)

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Troubleshooting

by FRED MURPHY

Winter Tune-Up

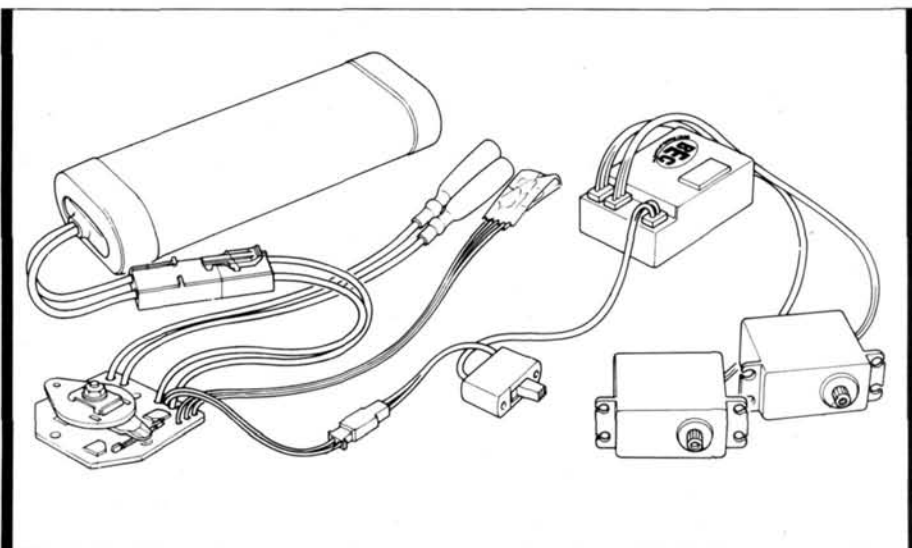
NOW THAT the racing season has concluded for many of the northern regions, it's a good time for rebuilding and winter clean-up. This rebuilding and cleanup is not aimed only at the seasonal racer or hobbyist, however, but at all R/C car enthusiasts.

This might be the perfect time to make that hot suspension change or put those bearings in the gear box to add that little extra we're all looking for. The principles I'll be covering apply to all cars and therefore might be oversimplified, so please refer to your car's assembly manual if you need that little bit of extra detail.



Stop shock leakage and retain optimum dampening by checking 3 mm O-rings for damage.

First, let's break down the car and remove the radio system. We're going to rebuild the car from the chassis up, starting with the radio system. On your work area lay out the servos, receiver, receiver switch or battery eliminator, and receiver batteries with speed controller, if your car is equipped with a BEC system. Wipe off all the components with a soft cloth to remove any dust and dirt that may have collected on them. Remove the receiver



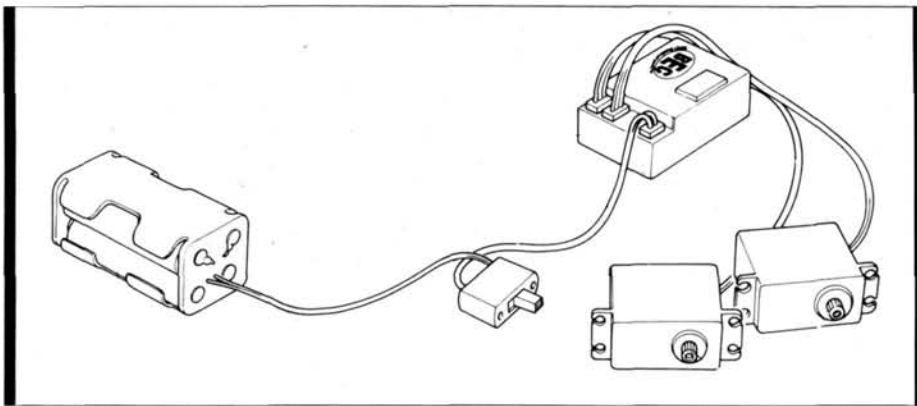
Battery Eliminator Circuit (BEC)-equipped system saves weight by eliminating receiver batteries. All diagrams courtesy of Tamiya.

batteries and make sure that the battery contacts are clean and dirt free. If there are signs of rust on the battery box contacts, it can easily be removed with a piece of fine sandpaper, emery cloth, or steel wool. For those of you using the BEC system, now is the time to do the inspection and cleaning of your speed controller. Look for signs of wear and dirt that may hinder contact of the controller's wiper arm. Once again a small piece of fine abrasive material will help clean up oxidation, but if there are deep grooves and scratches on the controller surface, consider replacing it now; it will only save you many headaches at a later date.

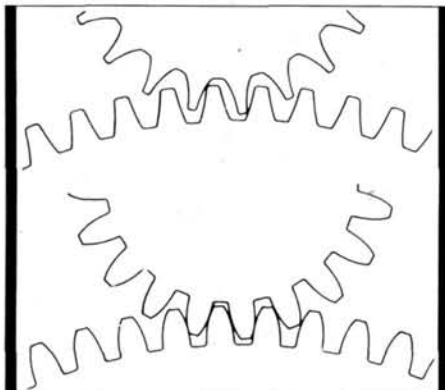
Check all radio system wiring for any cracks or breaks in the insulation. They might not look like much now, but annoying twitches and glitches could come about because of those harmless little cracks. Repair them now, not after you've lost a race due to failure. Make sure you also check the servo and switch

connections on the receiver for any dirt or poor contacts. Clean and replace the worn parts now, because shortcuts will catch up with you later.

Clean and inspect the gear box and drive train assembly. First remove the motor and inspect it for pinion gear damage. Make sure the pinion gear teeth have not been worn to a point, if so replace the gear. Then take apart the gear box, remove all the gears and bearings, and clean them. To degrease all parts, make a cleaning solution of warm water and a mild soap, or just plain alcohol is very effective and will not cause any damage to the resin plastics used in today's cars. After completing the degreasing, inspect these gears and gear box housing parts for wear and cracks. Many modelers overlook inspection for gear box housing cracks, which will cause a lot of problems with your car's performance. Once again, if the gears show signs that the teeth are getting worn,



Conventional radio system with dry-cell receiver batteries. Receiver battery box must be cleaned and checked.



Gear mesh on top shows wear that must be corrected for best performance. Excellent mesh and gear condition shown on bottom.

replace them. Also don't forget to inspect gear box bearings or bushings for wear and binding which can lead to major motor damage.

When it's time to reassemble the gear box, it's a good idea to have your car's assembly manual handy. I know you can probably assemble it in your sleep, but it's better to be safe than sorry. One note on regreasing the gear box: your local hobby supplier has the grease that is needed for your car, but a surefire standby grease I've used for years is automotive wheel bearing grease. It has staying power that has proven to be outstanding under all conditions.

As we move forward to the chassis, again wash and degrease the frame and continue on to the front-end components. Here careful inspection is once again required to insure a thorough rebuilding. Inspect A-arms for cracks and wear, along with checking bushings and bearings. Make sure that tie-rods are not bent and tie-rod ends and ball pins are not worn or damaged. Replace any worn parts and reassemble using grease in all points of movement to give your vehicle that new life it deserves.

As for the shocks, it's a good time to replace the shock oil and check damper parts so that a surefooted ride will be restored to your racing machine. If you detect any binding in the shock action, make sure the piston rods have not been damaged or bent. If you're going to attempt straightening a bent rod, please be careful! Any scratches made on the rod as a result of the straightening process will lead to possible leakage or other part damage that will drastically hinder suspension performance.

I hope that you find this general clean-up information helpful. Good luck and happy motoring!

Fred Murphy, c/o Radio Control Car Action, 632 Danbury Rd., Wilton, CT 06897.

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MRC BIG WIG

(Continued from page 99)

local track by using different shock settings and the pinion gears included in the kit.

MRC has really got a winner with this one, and it's going to be one of the new four-wheel demons at the local track.

Heads up honchos—Big Wig is here!

**The following are the addresses of the companies mentioned in this article:*

MRC/Tamiya, Model Rectifier Corp., 2500 Woodbridge Ave., Edison, NJ 08817.

Altech Marketing, P.O. Box 286, Fords, NJ 08863. ■

NEXT DIMENSION

(Continued from page 50)

any flying field or club, and you already know about radios, so let's talk about airplanes.

Compared to cars, airplanes are simple! The control systems do not require anywhere near the complexity of a good steering-suspension installation and, once installed, rarely need adjustment. The propeller couples the engine to the air and acts like a clutch and gears, just bolt it on

and go. There is more construction work required on airplanes and it is somewhat different from car assembly, but the wood is so nice to handle that it has a fascination all its own.

Your first airplane should be a trainer. That's a simple statement, but every R/C flier has his own ideas. These are mine:

The proper trainer is one that is rather large and light for its power. An example would be a high-wing monoplane (one wing) with a span of 5 to 6 feet that weighed no more than 4 pounds (complete with engine and radio) and powered by an engine in the .15 to .25 range. The fore and aft balance point should be no more than one-third the width of the wing back from the leading (front) edge of the wing.

The controls should operate the elevator, rudder, and engine. Your second airplane can be equipped with ailerons, but on the first one the three controls mentioned will make it easier for you to steer on the ground as well as in the air. It is an airplane, but it still has to be controlled on the ground! Don't buy a small airplane with a big engine or a

heavy airplane with any engine! You might consider sailplanes for they make excellent trainers, and you can fly them next door at the school yard!

Whichever airplane you decide upon, go ahead and get started. It will add much more than one extra dimension to your sport.

For additional help in getting started or for more information about model airplanes, check out *Model Airplane News*, sister publication to *Radio Control Car Action*. Subscription information for *Model Airplane News* can be found in the ad in this issue, or you can contact them at the address listed at the end of this article.

Randy Randolph, c/o *Radio Control Car Action*, 632 Danbury Rd., Wilton, CT 06897.

**The following is the address of the magazine zine listed in this article:*

Model Airplane News, P.O. Box 428, Mount Morris, IL 61054. ■

KYOSHO 4X4

(Continued from page 45)

chain to drive both differentials. This method works just fine, but due to the

New from BoLINK!

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R/C CARS, INC.

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(404) 963-0252

BL-2009 '34 Ford Hot Rod
BL-2375 '86 Buick LeSabre
BL-5364 Threaded Axle-1/12
BL-5174 Threaded Axle-1/10

simple nature of the chain, which is more flexible than a bicycle link system, you should occasionally check it to make sure the tension is correct. If it does stretch and become slack, Kyosho provides a procedure for removing a link to restore its performance. We've got about two hours of running on our own, with no measurable stretch yet.

After the assembly and radio installation are complete, follow the lubrication instructions and proceed with the 8-minute recommended break-in of the drive train components. Having completed this, head for the hills with a freshly charged pack. We used a Kyosho 6-cell 7.2-volt Sports Pack. In fact, we ordered two, so one could be recharging while we were using the other.

PERFORMANCE. The first thing you'll notice when you run your 4x4 is that it's not just a "stump puller" or "car crusher"—it also goes great on flat surfaces, showing good acceleration and top speed. In the turns it even leans a little like a full-scale 4x4; and because of its high-roll center, can even be coaxed into a flip, but not easily.

The deeply grooved terra tires, however, are much more comfortable foraging through forests and dirt piles, and this is where the 4x4 really shines. It traverses steep inclines with impunity. It boogies over hills that stop my two-wheel-drive cars in their tracks. The steeper, the better; the automatic centrifugal clutch goes to "low" for the hills and to "high" for the flats.

This Chevy is really rugged, like its full-size counterpart. It'll take rough handling and abuse, but don't expect its "concourse" appearance to stay forever. The rear-view mirrors and auxiliary driving lamps parted company early on and have been zapped back in place at least three times so far. Outside of that, everything remains intact and functional.

This is the first four-wheel-drive I've ever run and I really enjoyed it. You can do things with it that you just can't with other electric vehicles. It has thus far been relatively maintenance-free, hasn't required any replacement parts and continues to run great. Unfortunately, though, it's my sister-in-law's!

I wonder if my hobby shop takes trade-ins, so I can have one of my own?...

**The following are the addresses of the companies mentioned in this article:*

Kyosho: distributed by Great Planes Model Distributors, Co., P.O. Box 4021, Champaign, IL 61820

Pacer Technology and Resources, 1600 Dell Ave., Campbell, CA 95008.

Aristo: distributed by Polk's Model Craft Hobbies, 346 Bergen Ave., Jersey City, NJ 07304.

SPARE PARTS

(Continued from page 33)

the chassis. You won't need all that much ground clearance on a pavement car, and the lower it is, the better it will handle. Make sure that the tires are securely attached to the rims, or you'll tear 'em right off once you get it running.

Use servo tape to mount the R/C equipment wherever it works out best; but keep the left side of the floor pan clear. This space is to be reserved for the battery pack. Devise a method for secur-



ing the battery in place, allowing for some fore-and-aft and side-to-side adjusting. I use a set of holes in the floor and a couple of rubber bands to hold it in place, but Velcro or some straps will work out just fine. You might want to try running the antenna wire around the top of the chassis before you go and stick on an unsightly whip antenna. My cars seem to work fine, but you'll have to experiment. Do a range-check before you run the car to avoid losing control.

Painting the body can be a lot of fun because there's so much of it with a stock car. Most real stockers get painted with regular colors, because metallics and fancy effects are too hard to touch-up. Bright colors, like white, yellow, orange, or red, look neat and make the car easy to see in a pack. Most of the numbers and lettering are available in self-stick decal sheets at your hobby shop, as well as the sponsor-decals usually covering the front fenders. I make big numbers and some of the trim with Top Flite's* MonoKote trim sheets (available in many colors, also at hobby shops). What you do, in effect, is make your own decals. I find that the real finishing touch is doing the bumpers,

headlight doors, window bars, etc., with chrome MonoKote trim—it looks like the real thing. By the way, I use the body mounting-pegs out of the Frog or Subaru Brat (Tamiya) kits, which are available separately and simply screw into the wood. Any "hood pin" will work.

Now you're ready for testing. Find a spot that is similar to the track surface you'll be racing on—it makes a big difference in chassis setup. You'll notice that most of my pavement cars don't use suspension, as the places we race at are pretty smooth. If you've got suspension, set the right side up stiffer than the left, and, usually, the rear a little stiffer than the front. Leave a little for adjustment, though. Mount the battery about halfway out to the left of center, and in the middle, fore-and-aft. Accelerate, and notice any tendency to pull to the right while driving straight away from you. If it does, determine if it's because of wheelspin (on cars equipped with a differential), and if this is the case, you're better off locking it up or going with a straight axle. Locked rears are the fastest way around the track, anyhow.

Make a few hard left turns at a medium speed to see if it is going to over- or under-steer. Oversteering, or "loose," in stock-car jargon, is where the car tends to spin out, and understeer, or "pushing," is where it tends to go straight when you turn. Don't worry about turning right—the car will probably spin and flip over because of the left-side weight bias. If it oversteers, move the battery forward. If it understeers, slide the battery toward the rear. If it continues to understeer, you might need wider or softer tires up front; but try a little negative camber (wheel leans in at the top) on the right front. Experiment with these setups until you've found one you like. I prefer a car that has a slight "push," because it's harder to spin or get spun (stock-car racing is a contact sport!) in a race. Some people like a car that is "loose" and "drifts" through the corners, but it's harder to keep it set up that way.

Keep in mind what you did to make changes, you might want to go back to it at a different track. Once you get it dialed in, subtle changes will make it easier to drive. For instance, on a track with short straights, you can run a slightly larger tire on the right rear than the left rear. This will make the rear end (assuming it's locked) tend to steer the car to the left. You can dial-in a little trim on the radio to

(Continued on page 112)

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Contact: Tim Brass, President 278-4250

AROARA

(Alaska Radio Operated Auto Racing Association)
1/10 Scale Racing Series
4970 Fairbanks St.
Anchorage, AK
Contact: Bob Peters 345-3269

AROARA

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4000 Credit Union Drive
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Contact: Bob Peters 345-3269

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Riverside, MO 64150
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HO/RC RACEWAYS
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Joel Gish 251-2000

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(Not a mailing address)
Contact: Harry Jackman (916) 671-6677

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Aurora, CO 80012
Contact: Jess Brockman

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Steve Hickman, President

S.A.R.C.A.R.

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Contact: Tom O'Hara (206) 784-9656
or Ed Hagan (206) 271-0461

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Harbor City, CA
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VALLEY RACING

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Contact: Kenny March (703) 667-2468

WRECK

(Wheeling Radio Electric Car Klub)
Rt. 4, Box 117A-12
Milton Freewater, OR 97862
Don Rudy, Secretary

SPARE PARTS

(Continued from page 107)

keep it straight on the straightaways, but it will act like four-wheel steering on the corners. This is referred to as tire "stagger," and you use more stagger on tighter turns (check out the back tires on a short-track sprint car sometime). Pretty soon you'll have a good idea of what to do to make the car handle the way you want it to, and then you can consider a hotter motor or a seven- or eight-cell pack.

If you're like me, you'll realize that something is still missing.... It still doesn't sound like a stock car. Well, meet the Electronic Small Block Chevy—the Robbe* No. 8276 Large Diesel Sound Unit. Sure, it sounds like a diesel if you tune it that way, but if you adjust the various controls, the thing puts out an idle that sounds like a full-race engine with a hot cam. As the electric motor in the car speeds up, so does the sound unit, and it just about wails like a "358" with a flat crankshaft or eight-into-one headers! It doesn't weigh much, and it works off the car battery, with relatively low drain. By experimenting with speakers and baffles, it can sound pretty realistic and quite loud.

Now, if you're still not a pavement car convert, next time we get together I'll show you some tricks on how to go fast on dirt, so stay tuned.

Eric Goldschrafe, c/o *Radio Control Car Action*, 632 Danbury Rd., Wilton, CT 06897.

The following are the addresses of the companies mentioned in this article:

Robbe, 180 Township Line Rd., Belle Mead, NJ 08502.

Top Flite Models, Inc., 2635 S. Wabash Ave., Chicago, IL 60616. ■

TWO-STROKES

(Continued from page 76)

which it isn't supposed to do. The balls of the bearing should be doing the spinning. With the housing spinning upon the crankshaft, not only are a lot of friction and heat being generated, but a severe loss of power is resulting, as well as erratic operation.

The same thing applies to the crankcase. Check the seats where the bearings are housed and look for circular wear marks. There shouldn't be any.

The next things to check are the piston and sleeve. If there is a lot of carbon or varnish built up on them, they should be cleaned. Harry Higley recommends in his *Handbook for Miniature Engines* (avail-

able from Air Age, Inc.,* for \$10.95 plus \$1.50 postage and handling) to use 400-grit wet-or-dry sandpaper wetted in kerosene. The reason this varnish should be removed is because it inhibits the cooling ability of the engine, plus it acts as a drag on the piston when the engine is operating. This creates heat and can cause the engine to seize up at a very inopportune time.

Of course, there are other things that can cause your engine to run hot. An out-of-balance flywheel can cause your fuel to foam. This creates a lean fuel mixture, which in turn causes the engine to run hot. Too much of this and you'll be needing another engine.

Bad fuel can also cause problems. Fuel that is not stored properly can lose its punch, plus it can accumulate moisture. Also, if the fuel freezes and then thaws, the oil will separate and your fuel will look like one of those desk-top weights that snow when you turn them over.

The troubleshooting chart shown with this article gives some of the more obvious problem causes. If there is something that you've encountered that I haven't mentioned, please let me know. The hobby is a very enjoyable activity, especially when everything works as it should.

Jerry Stone, c/o *Radio Control Car Action*, 632 Danbury Rd., Wilton, CT 06897.

*The following is the address of the company mentioned in this article:

Air Age, Inc., 632 Danbury Rd., Wilton, CT 06897. ■

RACING STRATEGY

(Continued from page 42)

8. Get a good battery charge.

9. Be ready to get your car to the starting line as soon as your race is called. You must be among the first to set up in order to get preferred position. *Positioning your car for the start.*

1. It is more important to get a good start than to have the best line into the first turn. If you can get both, great, but if you must give up one, get a good start.

2. If the tire bite is good, start your car at either edge of the track. That way you have a car on only one side of you. Try to get someone whom you know is a straight starter to set up next to you. Set up near the edge so that no one can squeeze between your car and the berm of the track but still leaving yourself some space for maneuvering away

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RACING STRATEGY

from any problems inside.

3. If you can't get a good spot in the front row, line up behind a known good starter and go when he goes. Don't ram him. It won't help either of you!

On the driver's stand.

1. Tighten your focus as soon as you get up on the stand. Don't chit chat. Run that mental tape of the start and the line through the first turn as you programmed it in No. 7 above.

2. Don't rest your arms or elbows on the railing of the driver's stand, as this will tend to interfere with the light touch you'll need on your transmitter controls.

3. As the starter gets ready, concentrate on him and remember the cadence he used in prior races. When you think he's going to give the start signal, jump on it.

4. Focus on your car and the line you want to drive through the first turn. If you're there first, don't lose your focus. Concentrate on turning smooth, consistent laps.

Try to shut out all distractions and drive your car within your abilities. Don't let excitement cause you to make a mistake. If you do start making mistakes, slow down! When you have your car back under complete control, increase your speed but stay within your own limits. Most races are lost by the driver trying to go too fast.

Sometimes a turn marshal will be all thumbs or will seem to ignore your car. Don't let your temper climb. You'll lose your focus and defeat yourself.

Even in your early races it's not too soon to learn how to see other cars on the track with you. With practice you can see them appearing out of the corner of your eye. You don't actually focus on the other cars but you become aware of them, and at some distance as you become more proficient.

The best way I've found to practice this is to stand at the edge of the track when I'm not driving, pick out a car, and follow it around as if I were driving it but trying to see the other cars too. Without having to concentrate on driving, you'll soon improve your perception of the other cars on the track.

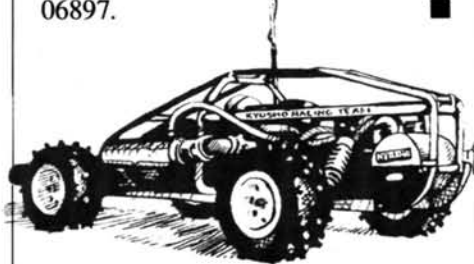
You can't ignore the other cars running any more than any other race driver can ignore his competition, because if you spend most of your time crashing into other cars you won't win many races. This is especially true on short, tight tracks where the leaders lap most of the field.

As soon as possible after the race, spend time alone and rethink the whole event. Try and recall the things you did right and the errors you might have made. Learn from both and your progress will be sure and steady.

In future articles I'll talk about "seeing" a race when you're in the thick of it. You'll learn about driving the various parts of the course, passing strategies, and evaluating the competition.

Until then, good driving!

Dick Brinton, c/o *Radio Control Car Action*, 632 Danbury Rd., Wilton, CT 06897. ■



INSIDE TRACK

(Continued from page 66)

These rules apply to most everyone in order to win.

In driving to win, one of the most important things is concentration. Our cars are pretty darn quick, whether in the dirt or on the pavement. That means that you must stay two steps ahead of the car at all times in order to drive fast. This rule is the toughest one to learn, because so many things are happening on the track.

Let's take a typical race situation. You're on the track with the car lined up ready for the start. Your first turn is going to be a pile-up of cars unless you get there first. Then, you have to protect your lead into the next turn. After that...

As you can see, you have to be on your toes from the start: being the first guy out, hitting the first turn safely before anyone else does, extending the lead while heading for the next turn and whatever else lies ahead. That's a lot to think about. Not only that, but as soon as the flag drops, you're watching for some hacker to hit your car. Here is where genuine concentration is needed.

You must keep your eyes on your car and only your car. The moment you even think about another car, you'll blow your concentration and probably crunch the car into the next turn. It's hard to keep your eyes off of the next car on your tail. He's gunning for you. But concentrate you must, or you will

make that guy's job of dusting you all that much easier.

Remember, you're not really racing the next guy, you're really racing the clock. All of our races are determined by who does the most laps in the least amount of time, so it does you no good to race the other cars. The idea is to turn laps, as many as you can rip off in the time allowed. No matter who is on your tail or how many there are ahead of you, just turn the laps.

I admit this is much harder than it sounds. I still don't concentrate as hard as I should, so I've tried some exercises that will help build up concentration.

In building up the concentration of some young drivers I helped to get into racing, I used to chase their cars around the track. There is nothing more distracting than some big oaf running around the race track, waving his arms all over the place, and hollering his head off while you try to drive. Once the guys got used to that, I then took the easy road and chased them with my car, sticking to their tail pipe. Believe me, you find out real quick if you're watching the right car or not with this exercise. When the guys finally got used to that one, I would stick a hot motor into the car and try to run circles around the other cars. It was more like me trying to hit their cars and them trying their best to drive through me. Like I said, it will teach you real fast about concentration.

Another good one is driving while the light isn't so good. Low lighting conditions make you look hard at the car and what is right in front of it. Soon you find yourself driving with tunnel vision and you actually see nothing else but your car. That's concentration! If you can practice on improving this one technique, you'll find that you can make much better lap times than ever before.

Now to our next rule of driving: smoothness of control. This has to do with the way you handle the transmitter while the car hightails it around the track. This can be a very decisive factor in winning or simply completing a race.

Smoothness of control means that you drive with finesse. Off-road racers sometimes drive like their speed controllers are On/Off switches. They simply aim the car and punch it, skid into the turn (hoping it points the right direction), and then punch it again. Granted, some of the cheapo cars literally have On/Off switches for controllers. Most of the more decent cars, however, have at least three speed

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controllers, and better cars have multi-banded resistors. The message here is—use them!

Don't drive like a drag racer with the foot to metal or on the brakes. You have different speed ranges that allow the car to drive through the turns, rather than plow through them. You should roll on the power, instead of punching it. Let me give you an example.

Take a normal 90° turn from off a short straight section. The car has a good head of steam coming in and it's time to hit the turn. Come off the power and into the brakes, but not hard. Hard braking throws the car into a slide that might or might not be controllable. Gentle braking keeps the car where you want it and even if it does start to slide, it will be more predictable.

As the car enters the turn, ease onto the power and make the turn with power on the wheels. Maintaining power on the wheels actually keeps the car more stable. When the car is sliding, it will roll over or spin out more easily. As the car progresses through the turn, start applying more power and you can exit the turn in a nice arcing line with more speed than if you slid into the turn and then punched it. Punching the throttle looks impressive when the dirt flies, but a smooth fast exit makes better time.

The way you handle the steering wheel also has a lot to do with smoothness. Many drivers whip the wheel from one direction to the next. The result is a car that drives everywhere except in the groove of the track. Most of the time, it is seen in the hands of track marshalls who are putting the car back on the track after launching over the berms.

Drive the wheel with smooth, deliberate movements. You should predict the turn you're entering and use just enough wheel to drive the car through. Going lock-to-lock usually puts the car into a spin or skid with the driver frantically attempting to stop it. Just like using the throttle in the turn, the steering should be used gradually without excessive whipping. The result will be a car that turns with far greater control and faster lap times.

Let's talk about you, the driver. You should drive with ice cubes on you, as in *cool*. Keeping your cool goes a long way in driving, and can get you out of more tight jams than any hot motor will.

There you are dicing for the lead when some hack takes a quick left jerk

right into your nose and sends the car to never-never land. If you've attended at least one race, you've seen it happen. And we've all seen the guy who spouts off by yelling at the hack or a track marshall and then resumes driving with a mad look on his face.

Well, driving with vengeance isn't going to get you anywhere. It's bad enough that you have to concentrate on the track, let alone trying to take out the hacker who binged you a second ago. The thing to do is to let well enough alone. Stop for just a split second and think about the track again. Meanwhile, the track marshalls will rescue the car and by the time it's on the track, you'll be mentally ready to concentrate on driving, not taking someone out. And don't worry about the leaders. They will have as tough a time getting around the same hacker as you did and probably will get binged just like you. Just do the laps and do the best you can. Anything less will be just that—less. Less laps, less enjoyment, less racing.



Our last little technique for driving to win is studying. Just like going back to school, studying the track can educate you. Ever wonder why some real race drivers are seen walking around the track before a big race? Maybe for fun, could be superstition, but most of the time, a race driver walks the track to study it. He looks for bumps and dips. He looks for the right groove in the turn to allow him the fastest line through. He looks for anything he can find that no other driver knows about yet so that he can have the advantage. You can do this too.

You should look seriously at any track you run on. Find those good lines through the turns and the hazardous bumps that could mean lost time. More importantly, know where you're going to drive on the track. To drive the track by simply staying on it is the hacker's way through. Driving the track knowing where you're going to enter and exit

a turn is the expert's way. This is the fastest way around the track, even if the line you take is wrong for the turn. Planning ahead keeps your mind on the driving and your level of concentration high. The result is that you drive faster and smoother.

Practice your technique and keep it polished. You'll find that you'll end up much closer to the winner's circle, if not in it, more consistently. It'll even make up for a slower car when the chips are down. Try it and see.

That about does it for this issue. I invite you all to send your questions and comments on anything with cars. I'll try and answer right here in "Inside Track." Stay tuned, too, for new products, hints, and news as I get them. You'll be the first to hear about it right here. Till next issue, foot to the floor!

Mike Lee, c/o *Radio Control Car Action*, 632 Danbury Rd., Wilton, CT 06897. ■

KYOSHO OPTIMA

(Continued from page 57)

any 4- to 7-cell, 100-4,000-mAh Ni-Cd battery safely and automatically.

PERFORMANCE. Running the Turbo Optima is where the real fun begins. I thought the Optima I built last year was great (see the Winter 1986 issue), but this beast just ate it alive. With the motor timing set at 6° and a 9-tooth pinion gear, the car accelerates lightning quick and has a very high top end. The suspension easily handles rugged terrain and can absorb large jumps without a bounce. The steering is positive, even over rough ground. With its low center of gravity and stabilizer bars, the car corners well with almost no tendency to lean in the turns.

Since this car is so souped-up already, only a few options are available. Kyosho offers different tires to suit various track conditions, pinion gears with various numbers of teeth, and motor and side guards.

I'd like to mention one point, however: after every three or four runs, initially, and then about every ten runs thereafter, the chain tension needs to be adjusted.

The Turbo Optima is a great car and will quickly climb to the top of the racing circuit. I can't wait to see what the fertile minds at Kyosho come up with next!

*The following is the address of the company mentioned in this article:

Great Planes Model Distributors, P.O. Box 1, Box 4021, Champaign, IL 61820. ■ •